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THE METAL INDUSTRY

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ELECTRO-PLATERS REVIEW.
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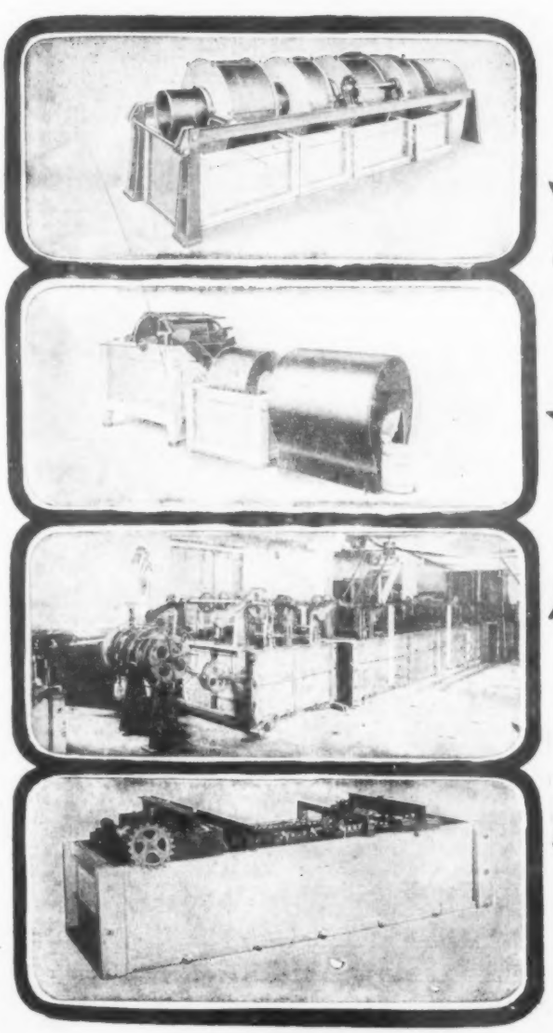

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THE METAL INDUSTRY
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ELECTRO-PLATERS REVIEW.

Vol. 15. NEW YORK, MARCH, 1917. No. 3

CANADA'S PROGRESS IN METALS

A Comprehensive Review of the Development of Canadian Metal and Manufacturing Resources During the Past Two Years.

Written for The Metal Industry by Francis J. Dickie.

[Since Canada's participation in the European conflict, the writer of this article has made a specialty of industrial changes and conditions in manufacturing, mining, metal and other operations upon which war

CANADIAN WOMEN MUNITION WORKERS IN TORONTO FACTORY TURNING, FACING AND FINAL PASSING UPON TOP AND BOTTOM RINGS FOR NO. 100 FUSE.

the Dominion of Canada's work under war conditions, both in regard to army mobilizing and upkeep, and the has had a tremendous affect. Pursuant with this work he has covered the Dominion from coast to coast,

visited munitions factories, steel mills and many other manufactories, talked with the heads of big business, and contributed the result of his research to a dozen of America's leading papers, the New York Times Current History and many other publications. The following special Canadian review compiled for THE METAL INDUSTRY brings to light many facts particularly interesting to those of the metal industries; facts hitherto given little prominence which show how large a place Canada occupies in the world's eye because of her enormous and as yet but half prospected mineral resources.—Ed.]

EFFECT OF WAR ON MINING.

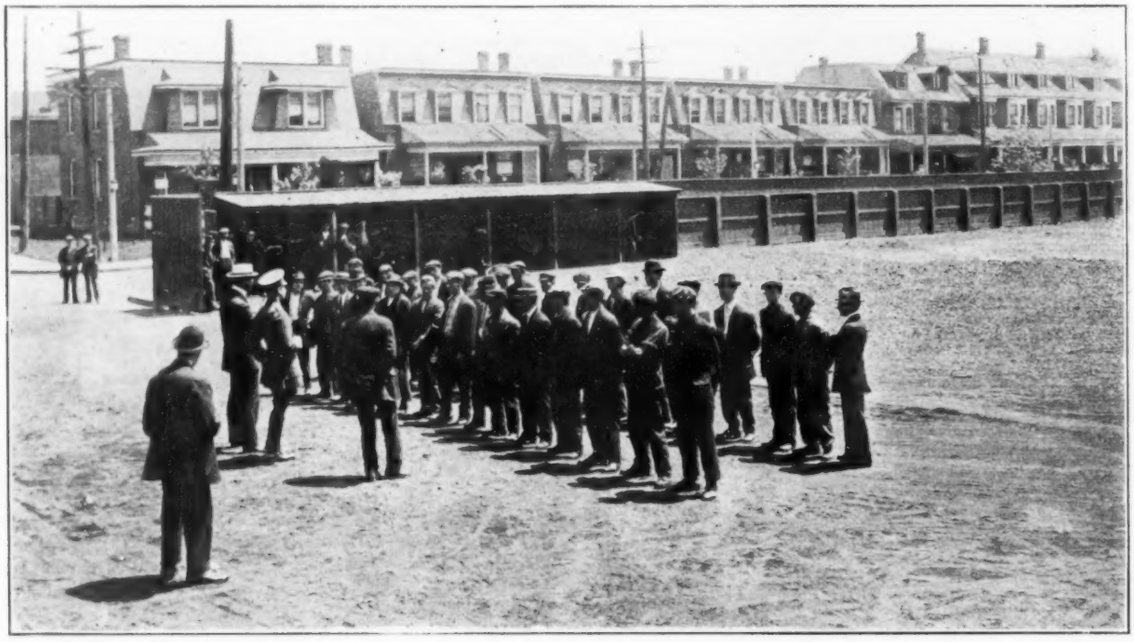
In Canada immediately preceding the war the metal industry, in common with mining and many other activities, was suffering from a financial depression existing at the time. When the first gun boomed in Europe all this was changed. War, by reason not only of its demand for munitions but for motors and a dozen other materials, immediately caused an unprecedented demand for many metals. The result in Canada has been the increasing to a remarkable degree of many metallurgical industries. The best idea of what war did for Canada can perhaps be gained by giving the statistical story of 1916, 1915 and 1914. The increase in the things given tells a story that needs no comment. The total value of the Canadian mineral output, as recorded in the Dominion Department of Mines report, was in 1913 $145,634,812. This was the maximum in Canadian history to that date. In 1914 production fell to $128,863,075, but rose in 1915 to $137,109,171, and in 1916 reached the unprecedented height of $170,000,000. Of this total the following metal production and value is given as being of most direct interest to readers of this article:

	Amount 1916	Value 1916
Pig iron production (gross tons)	1,046,185	
Steel ingots and castings (gross tons	1,298,325	
Copper production (pounds)	125,000,000	
Zinc		$1,000,000
Silver (ounces)	26,000,000	
Nickel (pounds)	83,000,000	25,000,000
Cobalt (ounces)	22,529,249	14,342,328

The most marked rise of all these was that of copper, a metal affected more by war than any other. In Canada in the four years previous to 1914 the output averaged from 56 to 76 million pounds a year. In 1915 this jumped to 102,612,486 and in 1916 125,000,000. This alone is greater than the combined output of the countries with which Canada is now opposed through war.

EFFECTS ON NICKEL INDUSTRY.

Right here it will perhaps be best to mention how really potential a place Canada occupies among the countries of the world by reason of her mineral resources. In the matter of nickel, that most necessary metal in the production of armor plate and big guns, the Dominion produced eighty per cent of the total of the whole world; and that from within her borders in the Province of Ontario. This comes from the Sudbury district, supplemented by a small tonnage of ore from the Timiskaming and small quantities of metallic nickel and nickel-oxide from the silver ores of Cobalt. Previous to 1916 the most of the product was refined outside of Canada, but through the exigencies of war nickel refineries to treat the matte within the bounds of the Dominion are now in the course of construction by the International Nickel Company at Port Colborne, Ontario, and the British-American Nickel Corporation.

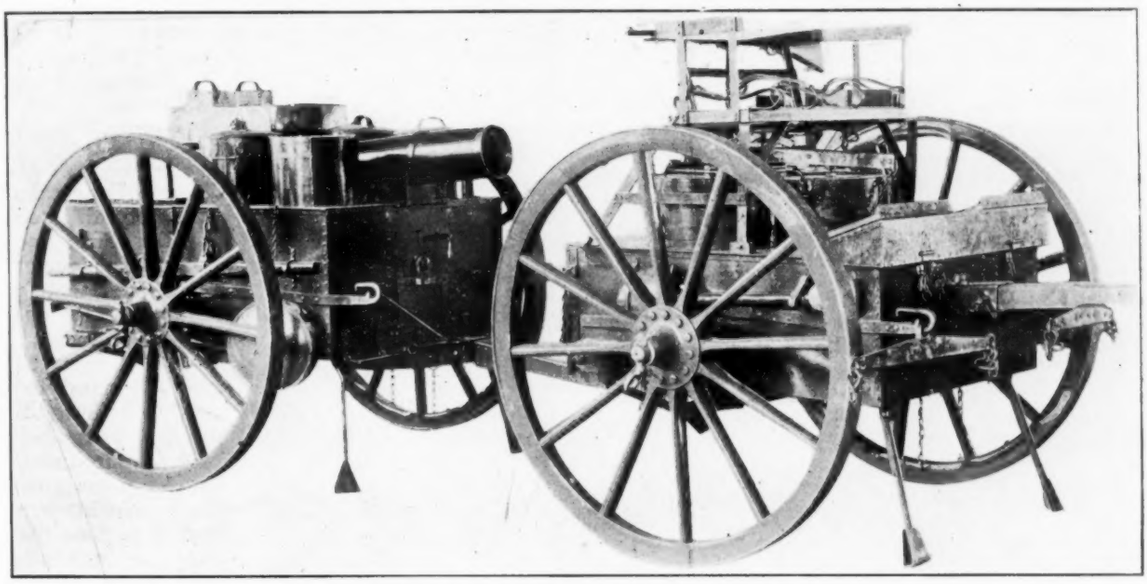


"YOUR KING AND COUNTRY NEED YOU." THIS SIMPLE PHOTO IS YET IN A WAY A MASTERPIECE. HERE WE SEE A GATHERING OF WORKERS FROM A BIG CANADIAN METAL PLANT LISTENING TO THE RECRUITING OFFICER DURING THE NOON HOUR REST IN THE YARD OF THE PLANT.

COPPER AND ZINC.

Next in importance, in so far as war is concerned, come the copper and zinc metals which used in conjunction with steel are so largely used in the making of shells and other munitions. Thus the war more than any other contingency emphasized upon Canada the absolute necessity of establishing within her borders copper refineries. So

in 1916 at Trail, British Columbia, two copper converters, turbo blowing engine for same, and reverberatory furnace and anode casting plant were installed. Also an electrolytic copper refinery, capacity twenty tons a day, has been built and equipped, and a copper refining furnace and casting equipment provided. Of the total of 125,000,000 pounds of copper produced by the Dominion in 1916, British Columbia supplied approximately 70,000,000 or nearly fifty per cent, and in this Province are situated five copper blast furnaces at Trail with a capacity of 3,000 tons daily. In the Boundary district there are two copper smelteries. One, the Granby Company, has eight blast furnaces, capacity 4,000 tons daily, and three converter stands with ten shells, producing capacity about 50 tons of copper per day. The second company, The British Columbia Copper Company, has three blast furnaces, with a total capacity of 2,000 tons per day, and two converter stands with seven shells. In the coast district the Granby Company has at the town of Anyox a blast furnace with a capacity of 3,000 tons a day, and three basic converters of the Great Falls type.



CANADA'S "SHEET METAL GUN" A FIELD KITCHEN THAT CAN FEED 500 MEN PER HOUR AND KEEP FOOD AND LIQUIDS COLD OR HOT FOR 12 HOURS.

THE FIELD KITCHEN AT WORK.

Both these companies ship their converter copper to eastern American refineries. The British Columbia Copper Company is now at work developing a new field in the Smilkameen Valley with a prospective of 12,000,000 tons of ore available. There are a number of other good producing mines at Trail, Rossland, Phoenix, British Columbia, and on Texada Island and at White Horse in the Yukon.

When it is taken into consideration that in the thirty months of war from August, 1914, to December, 1916, Canada accepted orders for $750,000,000 worth of shells and munitions, $500,000,000 of which has now been delivered or is ready for delivery from a country that in August, 1914, had but two munition factories, and these hardly worthy of the name, when this is taken into consideration, it will be easily realized how large a part the metal and mining industries of the Dominion played in making this possible. From two small munition factories in 1914 Canada now has to her credit the amazing total of 422, with some 15,000 skilled workers, among whom are now some two thousand women.

Through the war, zinc was produced for the first time in commercial quantities in 1916. A smelter began production in March, 1916, producing to the year's end 6,000,000 pounds. The production for 1917, as approximated now will be at least triple that amount. Some difficulties, incidental to the standardization of the production in a large way of electrolytic zinc, were met with at first, but have been largely overcome.

LEAD.

Lead has been produced with ever increasing quantities since 1904. The Kootenay District of British Columbia supplying practically all the ore mined, although a little galena ore has been shipped from the Hazelton district in the same province and from the Yukon. The whole output has been refined at Trail, B. C., and the establishment there of a zinc reduction and refining plant, several units of which have been in actual operation during the last half of the year, has provided an additional source for lead, since both the lead and silver contained in the zinc ore are recoverable from the residue remaining after the refining of the zinc. The lead production was 39,974,411 pounds.

MAGNESITE AND MAGNESIUM.

As a direct result of the war an almost entirely new activity in the mining of magnesite has taken place. A product of this, metallic magnesium, now used so extensively on the war fronts by French and British troops

for flare lights in night warfare, was perhaps the major reason for the taking up of this product, first discovered in 1900. The occurrence in Canada of carbonate of magnesia was noted in Quebec Province not far from Montreal; and its quarrying carried on in a very small way from 1904. The chief market was the United States. However, the Canadian product did not compete with that shipped from Austria and Hungary, chiefly by reason of the foreign products peculiar suitability for use in steel furnace linings and in the manufacture of refractory brick. With the war and Britain's blockade the Canadian supply naturally came into demand. Shipments in 1915 reached 14,779 tons, valued at $126,535. No statistics are available for the past year, but about an average output of 200 tons per day has been maintained.

COBALT USED IN PLACE OF STEEL.

One of the most interesting and valuable discoveries directly due to war was the production of a stellite tool from metallic cobalt. Metallic cobalt is being used in considerable quantities in the manufacture of the alloy known as stellite, so named from its star like appearance when polished. It is a cobalt chronium alloy to which a small proportion of tungsten is added, the principal use to which it is now put is in the making of high-speed tools very valuable to munition workshops. The following tests made in a Toronto munition factory where 18-pounder shells were being manufactured speaks for the tool: A tool of high speed tool steel will ordinarily make the first cut on from 25 to 30 of these shells without regrinding. The stellite tool made 300 cuts before it was necessary to regrind it. Then the steel tool ordinarily take two minutes to make this first cut; to run it faster would cause it to lose its temper. Stellite has no temper and it was found possible to speed it up till it made a cut in 30 seconds without loss of efficiency in anyway. Therefore stellite's value is very large, and yet it is sold at a price only slightly above cost of best high-speed tool steels.

Turning back once more directly to the question of Canada's resources: As already stated the Dominion produces eighty per cent of the world's total of nickel. In addition Canada produces and controls 85 per cent of the world's asbestos mined in the Province of Quebec. It is in fact Quebec's chief mining industry. In 1900 21,408 tons were mined, valued at $719,416. In 1916 140,000 tons, valued at $4,750,000.

In addition to an almost world control of these two things, and a large production of copper, zinc, silver, gold and many lesser metals Canada has her coal without which smelters and many manufactories could not operate. One-fourth of the world's coal areas are in Canada. In 1916 14,365,000 tons were mined.

NEW OPERATIONS DUE TO THE WAR.

In connection with new ores, the fact that several thousand dollars a ton was being paid for molybdenite (MoS_2) at the beginning of the war directed attention to the search for this mineral in Canada. This resulted in the last year and a half in the development of a number of properties in the Provinces of Quebec, Ontario and British Columbia. In Quebec the most important property was developed. This is at Quyon on the Ottawa river about thirty miles west of Ottawa. Two hundred and fifty tons of ore a week were shipped from here during the latter part of 1916 containing about 2½% molybdenite. During 1917 it is hoped to produce in Canada at least 100 tons. The product is being sold partly in the form of concentrates and partly as ferro-molybdenum, the latter being produced in electric furnaces at Orillia and Belleville, Ontario.

The whole output is being taken by the British Government for munition use, the price said to be $1 per pound.

And while war was speeding up all kinds of manufactories and metal and mining industries, impetus was also given to research for new mineral fields. In this respect Canada has been the most lax of nations. Possessed of resources of an incalculable value the prospecting of only a small area has been thoroughly carried out. The war gave the necessary stimulus. The largest and to date first, to take up this work has been the Canadian Pacific Railway. Early in the Summer of 1916 Baron Shaughnessy became the head of a research board. Arthur J. Little, of Boston, a famous metallurgist and geologist is in active charge of the work and has gathered around him a group of experts in all lines. Under his leadership the zinc, lead, feldspar, manganese, oil, graphite and many other mineral resources of the entire Dominion will be exhaustively prospected.

SOLVING THE LABOR PROBLEM.

During the two and a half years of increased production the chief trouble in practically all lines of industry has been the labor situation. First under the urge of patriotic fire men deserted their place at lathe, retort and crucible. The army claimed thousands of skilled mechanics. Then as the time dragged on, public feeling and the urge and blandishments and the bullyings of recruiting officers sent men, at first reluctant, into the army. Yet all the time the demand for workmen increased. In addition to turning out all kinds of munitions, Canada furnished her troops with her now most famous weapon of war, sometimes known as the "Sheet-metal" gun. This was not a gun at all; but a field kitchen. This McClary field kitchen made of aluminum is fitted with compartments on the Thermos bottle system and in it food can be kept hot or cold for a period of twelve hours. Moving on wheels it proved a remarkable aid to the fighting men. As Napoleon once said: "An army travels on its stomach." The "sheet-metal" gun provided the most adequate method of keeping the stomachs supplied. Some fifteen of these are now in use by the United States.

The chief call for men skilled in metal working and allied trades came from the munition factories. But so great was the scarcity of labor that in the middle of 1916 many factories began taking on and training women workers, as had already been done in England. The experiment proved successful, and today some 2,000 women are working in various Canadian factories with this number being added largely to every day. On such work as stamping, cutting out, turning and assembling of parts for smaller shells and time fuses women have in certain cases proven superior to men. Even such work as requiring accuracy in cutting to 1-1000th of an inch has been successfully performed by women's hand. Old and young alike are sharing in the work.

But so varied and voluminous have been the Dominion's accomplishments in the last 30 months that ponderous tomes might be written. Through war Canada stands as no longer a land of beginnings; but a land supplying billion dollar munition orders; a land who is feeding her own and warring armies for the allies; a land which from out her boundless wealth of natural resources is supplying and will continue to supply metals and munitions till war shall end, and all the channels of trade be turned to the new business of peace.

ALUMINUM ROLLING MILL PRACTICE

AN EXHAUSTIVE ARTICLE DEALING WITH THE WHITE METAL, ITS OCCURRENCE, PROPERTIES AND MODERN METHODS OF WORKING IT, SUCH AS ROLLING AND ANNEALING

WRITTEN FOR THE METAL INDUSTRY BY GEORGE LYON JR.

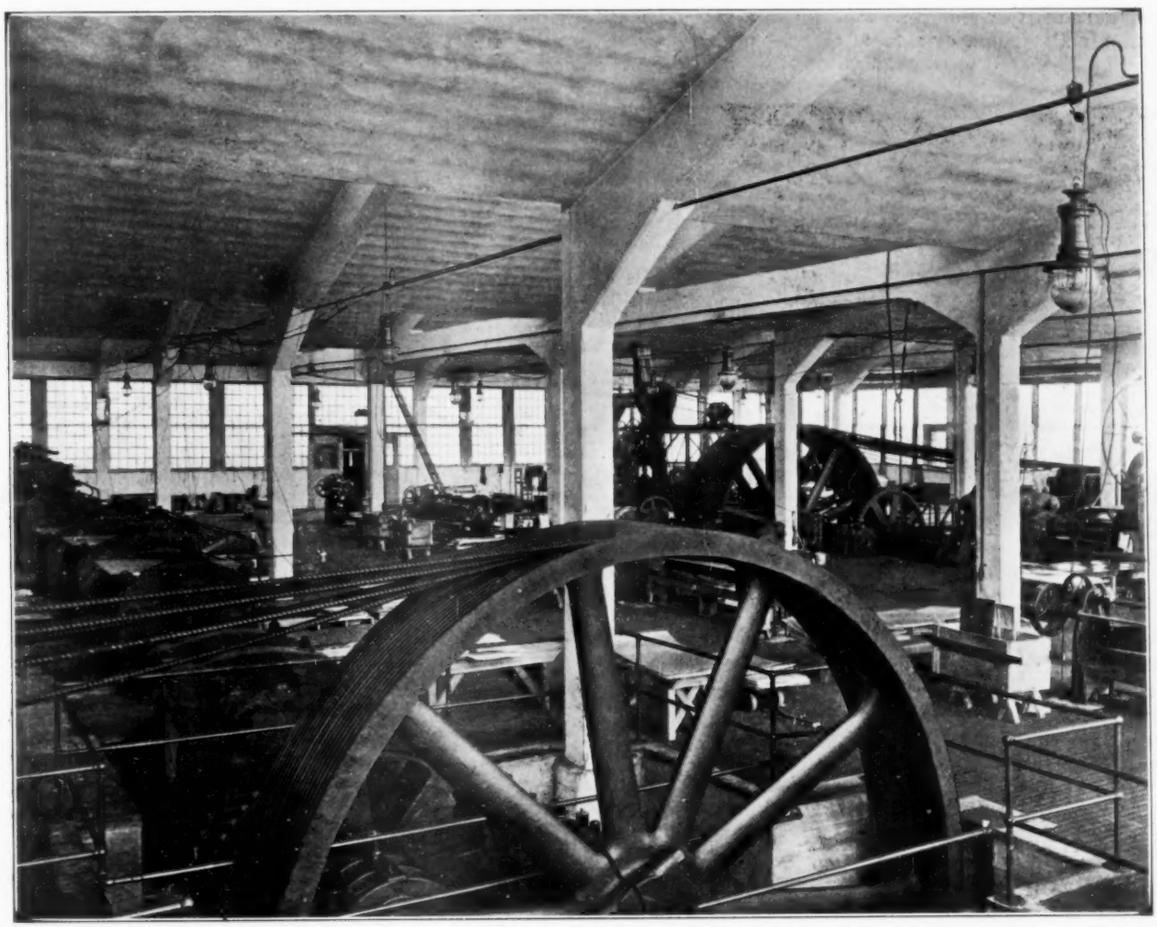
(Concluded from January)

After cooling off, metal for sheets is taken from the hot mill to the slabbing mill for cold rolling. Sheets up to No. 20 B. & S. gauge are finished single. Nos. 21, 22, 23 are finished two in a pack; Nos. 24, 25, 26, 27 three in a pack; Nos. 28, 29, 30 four in a pack; Nos. 31, 32, 33 six in a pack; Nos. 34, 35, 36 eight in a pack; it being figured to keep the total gauge of the finished pack between .040 and .060 of an inch.

If sheets are to be finished single, they are slab rolled to ⅛ inch. One set of the rolls is made and the sheet given 4, 5, 6, 7, or 8 passes, according to the width of sheet condition of rolls, etc. At ⅛ inch the sheets are sent to the roughing mill. One set is made rolls is made and the sheet given 25 or 30 passes, when if the rolls are in the proper shape, it should lie perfectly flat and be within .001 or so of gauge. The screws are then given a light tap and the sheets passed through the rolls 5 or 6 times when it should lie perfectly flat and be down to gauge.

If it is not necessary to have a perfect sheet, fewer passes may be given and the finished sheet run through a seven or nine roll flattener, and the surface improved by drying out in gasolene, air slaked lime, or some other method.

All sheets, both single and in packs, are slabbed, roughed, and finished on dry rolls. A swab, dipped in



A VIEW IN A MODERN ALUMINUM ROLLING MILL.

on the roughing rolls and the sheet given 6, 8, 10, 12 passes according to width of sheet, condition of rolls, etc., to within 2 numbers of the finishing gauge.

In both slabbing and roughing the roller must use judgment as to the number of passes he gives the sheet, in order to have the right amount of center in the sheet, and cause the finishing roller as little trouble as possible in finishing.

On the finishing rolls, if the sheet must be finished perfectly flat and have a good surface, one set of the carbon oil and the oil then partly squeezed out, is rubbed once or twice across each roll to prevent the sheet from sticking to the roll; and the finishing rolls are equipped with buffs to brush off all loose metal or dirt.

When the sheets are to be finished in packs, they are slab rolled to about .095, and then sent to the shears to be trimmed to width and length necessary to make the finished sheet. For a sheet 30x72, No. 27 B. & S. gauge, either hard or soft finish, the procedure would be about as follows:

After trimming, the sheets are matched in sixes and sent to the roughing rolls. One set is made on the roughing rolls and each sheet given two or three passes. The six sheets are then matched in twos and each set of twos given 3 or 4 passes. One set of twos is then split and two sets of threes made. Each set of threes is then given 5 or 6 passes, when the sheets are changed so as to bring the middle sheet in direct contact with the roll, and the pack given 5 or 6 passes more, so as to bring the gauge of each individual sheet to No. 25 B. & S. gauge. The ends and sides of the pack are then trimmed of rough edges, and the pack sent to the finishing rolls.

One set is made on the finishing rolls and the pack given 25 or 30 passes or until the sheets lie perfectly flat and the gauge of each sheet is about .0145.

The screws are then set down slightly and the pack given 5 or 6 passes, when it should lie perfectly flat and be down to gauge. During the passes the sheets are changed so that both sides of each sheet come in direct contact with the rolls. In making his set on the finishing rolls, the roller figures he has three sheets, each about .018 thick or a total of .054, and each sheet is to finish about .014 or a total of .042. He makes his set as if he were going to finish a single sheet .042.

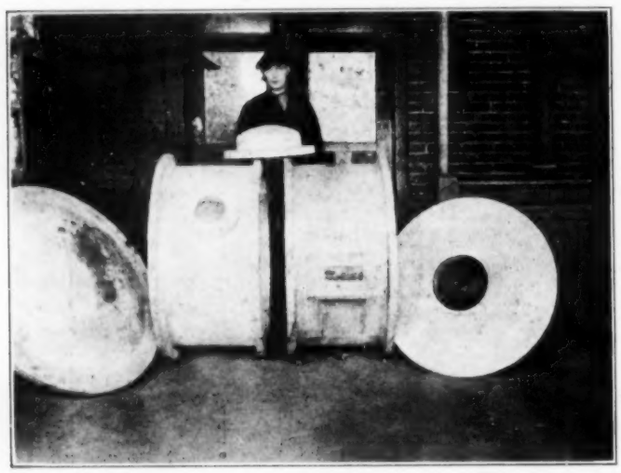
The roughing roller must use good judgment as to the number of passes he gives a pack, so as to have the right amount of center. If too many passes are given, the center will be worked out and the finishing roller have trouble in getting the pack down to gauge, while if too few passes are given there will be too much center, and the sheets will be likely to cut on the finishing rolls. Most of the work is done on the middle of the rolls, and the continual friction causes the rolls to warm up and expand. This has a tendency to work out the center of the sheets, and is avoided by giving fewer passes or letting up on the screws.

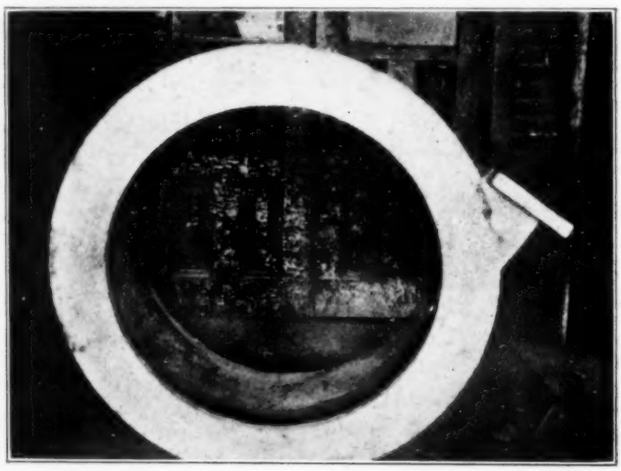
If the sheets are to be finished 2 numbers hard, the pack is rolled to No. 23 B. & S. on the roughing rolls and then sent to the finishing rolls. The finishing roller handles the pack as though he were finishing it No. 25 B. & S., particular care being taken to see that all the center is worked out. After annealing, the roller who last handled the metal finishes it by giving the pack 30 or 40 passes. Other tempers, both single sheets and in packs, are handled in a similar manner. In rolling aluminum 2 numbers hard, it is not necessary to set the rolls very tight, 2 numbers on aluminum comparing with ¼ or ½ number on copper or brass. The crew on all sheet mills consists of one roller and one, two or three helpers, depending on the class of work.

Strip aluminum is handled in much the same way as strip copper. The metal is soft and will stand heavy reductions. Metal oil mixed with carbon oil is used, but hard wood plates and wedges are necessary to prevent scratching the metal. When a bridle is used the rolls of the bridle are encased in wood and the wood covered with leather. When blocked, too much tension must not be applied, as aluminum tears very easily.

In running down strip aluminum one company uses a continuous mill. The idea is not new except as it applies to the rolling of the non-ferrous metals, having been in use for time out of memory in the iron and steel mills. It has not been tried to any great extent in other mills but there is no doubt that it can be successfully used on copper.

In order to use a continuous mill for rolling copper strip it probably would be necessary to change somewhat the practice in hot rolling. In most copper mills it is the practice in hot rolling for strip copper, to roll a sheet wide enough to get from two to four widths. When sheared the several widths do not all run the same as on the cold rolls, and it is necessary to make as many lots of metal as there are strips in the sheet. This would cause trouble on the continuous mill. In hot rolling aluminum for the continuous mill the ingots are rolled wide enough to make a single strip, and care taken to have all the strips in a lot the same. This could be done with copper, and any disadvantage in doing so would be more than compensated for in the saving made on the continuous mill.





A 350 POUND PURE ALUMINUM CYLINDER CASTING 42½" O. D. WITH A 2" INSIDE AND OUTSIDE FLANGE OF ¾" METAL. MADE BY THE SHEELER-HEMSHER COMPANY BRASS FOUNDERS, PHILADELPHIA, PA.

THE CONTINUOUS MILL

The continuous mill referred to consists of five stands of rolls set tandem, the succeeding stands of rolls being connected by gearing to a higher surface speed in order to take up the increased length and speed of the strip of metal being rolled. The rolls are 28 inches by 36 inches. No pinions are used, the bottom roll of each stand being connected to the driving gear by spindle and coupling. The wabbler on the opposite end of the bottom roll is fitted with a gear

which meshes with a similar gear on the wabbler of the top roll.

Above these gears at about the height of the shoulder of the housings a platform is built, along which the roller walks while watching his metal. Mills Nos. 1, 2 and 3 have screws with ½-inch pitch, Mills Nos. 4 and 5 screws with ¼-inch pitch. Mills Nos. 1, 2 and 3 are provided with a large hand wheel and cross shaft on top of the housings for working the screws and adjusting the height of the top roll. Mills Nos. 4 and 5 have two screws in each housing, placed front and back, each screw fitted with a short spanner. This idea is taken from the steel mills, and it is claimed gives the roller better control of his work.

The approximate speeds of the different mills are:

Mill No. 1	4.6 R. P. M.
Mill No. 2	8.5 R. P. M.
Mill No. 3	13.0 R. P. M.
Mill No. 4	17.6 R. P. M.
Mill No. 5	21.4 R. P. M.

After hot rolling, the metal for the continuous mill is sheared to width. The alloys of aluminum are annealed before cold rolling, but this is not necessary with the pure metal. Carbon oil only is used on Mills Nos. 1 and 2, and carbon oil mixed with metal oil on Mills Nos. 3, 4 and 5.

A knowledge as to the way to run the mill and the best pinches to give the metal on the different mills can be acquired only with practice. In this connection it is interesting to note that, although the speed is constant, different widths of metal going to the same gauge require different pinches in order to get the best results.

The pinch on Mill No. 1 is not important, but is usually a heavy one. On the other mill, however, the pinch must be regulated so as to keep the metal tight and yet not have one mill pull faster than the preceding mill throws off. As the strip of metal passes from one pair of rolls to another, the roller walks along the platform and makes any necessary adjustment to the screws. He must be a skillful man and quick to act, particularly on Mills 4 and 5. Most of the wear is on these two mills, which require careful grinding.

The following list of pinches illustrates the work that may be done on a continuous mill. These pinches are not positive and are altered for different widths and gauges:

Metal 12 inches wide and ⅜ inch thick.

Mill No. 1	to .195
Mill No. 2	to .115
Mill No. 3	to .080
Mill No. 4	to .063
Mill No. 5	to .051

The number of pair of rolls through which the metal is passing at one time varies with the width of the strip and the gauge to which it is going; but is seldom more than three pair. It is estimated that an average of 400 H. P. is required to operate the mill.

The crew consists of three men, roller, sticker, and catcher; and these three men turn out as much work as could be done on a single pair of rolls doing the last pass only, thus eliminating the entire help of four pairs of rolls.

It must be admitted, however, that the metal from the continuous mill is usually not in as good shape as that rolled on a single pair of rolls, but answers for most purposes.

Aluminum foil is now successfully rolled in long lengths for feeding to automatic machines, etc. The metal is rolled on the regular strip rolls to about .003 and annealed. It is then put on a small mill of special design and construction and given several passes. In the last pass a strip of oiled paper is rolled on the metal, and in this condition is ready for use. The present demand for aluminum foil far exceeds the supply, and the field for its use is practically unlimited.

(The End)

ROLLING COPPER THIN

Copper, six inches wide, is run down on a strip mill from No. 14 to No. 30 and annealed. It is then rolled from No. 30 (.010) to .001 without further annealing, the rolls being set tight together and the strip of metal repeatedly passed through the rolls until it is down to gauge. In rolling from No. 24 to .0005 it might be advisable to anneal at about No. 36, but this can be determined only by experiment.

A short chunky roll gives the best results 10 x 12 inches, 12 x 14 inches, 14 x 14 inches, 16 x 24 inches are good sizes; 9 x 18 inches, 10 x 18 inches and 12 x 24 inches are standard sizes, but they are too springy and not as satisfactory as the others. The rolls are crowned, but not quite as much as for the regular run of work. From .000½ to .000¾ of an inch to a foot of length of roll is enough taper for thin work. The mill must be lined up as true as possible for any side motion of the rolls is fatal to thin metal. A speed of 125 feet per minute is plenty fast enough, and one crew can take care of two pair of rolls.

Lard oil is used and the metal is bridled on every pass. Care and good judgment must be exercised in using the oil, especially in cold weather. If the oil is too heavy or too much is put on the metal it will cut or break in the rolls. The oil is cut down either with kerosene oil or soapy water, the latter being made of ¼ to ½ pound of whale oil soap to a gallon of water. For economy some of the mills use as little as 5 per cent. lard oil, the balance being soapy water. I doubt the real economy of this, however, as more passes are required to reduce the metal so fifty-fifty ought to be a better proportion. The quality of oil used on the first pass should be used on the succeeding passes as changing the quality of the oil is likely to cause the metal to cut in the rolls.

The practice in bridling the metal varies in the different mills. Some use the regular plate and wedge with an outside bridle and these are covered with felt to prevent scratching the metal and also to hold the oil and spread it evenly over the metal. In others the plate and wedge are dispensed with and an inner bridle used. Some mills use both inner and outside bridle, others the inner only. Above all it requires a good roller; a man who can put his rolls in shape and keep them there.

The metal is blocked either by hand, or on a machine block, but no more tension should be applied than is necessary to wind up the metal. If a collapsible block is used, the metal must be loosened up before annealing, otherwise it will sweat in the furnace and the layers of metal stick together. Where metal is backed off the block it is not necessary to loosen it up. The greatest trouble in annealing all thin metals is in burning the edges. This can be avoided and the metal well annealed by giving a slow even fire, but at a lower temperature than for the same kind of metal in a thicker gauge.—G. L.

COST-FINDING

SOME PRACTICAL METHODS FOR BRASS, BRONZE AND ALUMINUM FOUNDRIES.
ABSTRACTED FOR THE METAL INDUSTRY FROM BULLETIN NO. 4, NATIONAL FOUNDERS' ASSOCIATION.

METHOD OF DEPARTMENTAL DIVISIONS.

The natural divisions into which the manufacturing expense of the jobbing brass foundry falls are: Melting, molding, coremaking, cleaning, inspection, shipping, pattern making, machining, general. It is understood that the pattern shop and machine shop are engaged in the correction and repair of the customer's patterns, and the general upkeep of the plant and equipment respectively. While they may make patterns on the customer's order, or machine castings for him on occasion, they are not generally engaged in these manufactures, but are subsidiary departments of the foundry and to be considered as such. It is evident also that the inspection and shipping costs may be combined in summarizing the departmental costs, for easy comparison from month to month. This plan of collecting the cost data makes possible the detection of variations in the costs of each department.

Proceeding with this plan of departmental division we have the following items making up the cost of castings:

METALS (A).

Department or Class No.

A1. Purchased metals: such as copper, tin, lead, zinc, phosphor copper, any purchased scrap, not to be confused with foundry scrap, resulting from heads, gates, pickings and defective castings.

A2. Heads, gates, pickings and defective castings.

MANUFACTURING EXPENSE (B).

B1. Melting: labor (B10), supplies (B11), overhead (B12).

B2. Molding: labor (B20), supplies (B21), overhead (B22).

B3. Coremaking: labor (B30), supplies (B31), overhead (B32).

B4. Cleaning: labor (B40), supplies (B41), overhead (B42).

B5. Inspection: labor (B50), supplies (B51), overhead (B52).

B6. Shipping: labor (B60), supplies (B61), overhead (B62).

B7. Pattern Making: labor (B70), supplies (B71), overhead (B72).

B8. Machining: labor (B80), supplies (B81), overhead (B82).

B9. General: labor (B90), supplies (B91), overhead (B92).

BUILDING AND EQUIPMENT (C).

C1. Building: labor (C10), supplies (C11), overhead (C12).

C2. Equipment: labor (C20), supplies (C21), overhead (C22).

SELLING EXPENSE (D).

The various items of the selling expense may cover salesmen's salaries, advertising, traveling, interest, discounts, outbound freights, etc., as the management may decide. Generally the departmental letters and numbers are not used, but they may be as in the other departments, if desired. Overhead is not charged to Selling Expense.

METAIS.

Under this plan, A1 metals carry their original purchase prices until each lot is exhausted; or, until, at the close of any inventory period it is found advisable to write the prices down, because of a rapidly falling market. A2 metals are readjusted to the prevailing market value of metals at each inventory period, monthly or quarterly.

The most important feature in handling non-ferrous metals is the recognition of the loss which occurs in melting. The following example illustrates the actual condition.

Metal charged	20,000 lbs.	
Good castings made		10,000 lbs.
Gates, risers, scrap, etc		8,000 lbs.
Dross, pickings, etc		1,000 lbs.
Loss by difference		1,000 lbs.
Total	20,000 lbs.	20,000 lbs.
Loss, % of metal charged	5%	
Loss, % of good castings	10%	

The fact that the metal lost in melting must be carried by the pounds of good castings produced, when making prices, is often overlooked or deliberately disregarded. In this example the weight of good castings returned happens to be 50 per cent. of the charged weight. In the case of manganese bronze, the yield of good castings is often as low as 25 per cent. of the charged weight, because of the heavy shrinkage of this metal, and the need of long runners. The loss at the furnace is heavy, because of the high temperature required, and the high zinc content. The furnace loss may run 7½ per cent., which brings the melting loss on a 25 per cent. yield to 30 per cent. If a manganese bronze mixture is costing 30.0 cents per pound, the metal loss probably runs 9.0 cents per pound.

MANUFACTURING EXPENSE.

The labor is distributed from the time cards returned by each department, as shown on the payroll. The supplies are collected in a similar way. Overhead is carried to each department in proportion to its dollars of labor. Under this plan the foremen are charged up to their respective departments, such as melting, moulding, coremaking, etc. Foundry clerks in charge of time cards, order cards and foundry records are charged to molding. The superintendent's time may be divided over melting, molding, coremaking and cleaning, when inspection, pattern making, machining, shipping and general are handled directly by a works manager. Arbitrary divisions of some items of the payroll will be necessary, as they will vary with the size of the foundry and its general organization plan.

Assuming an arbitrary set of figures for illustration, the following summary may be made. The figures are cents per pound:

Department.	Labor.	Supplies.	Overhead.	Total.
Melting	0.53	0.10	0.47	1.10
Molding	1.03	0.12	0.94	2.09
Coremaking	0.29	0.12	0.27	0.68
Cleaning	0.35	0.10	0.23	0.77
Inspection	0.08	0.00	0.07	0.15
Shipping	0.05	0.04	0.06	0.16
Machining	0.02	0.00	0.01	0.03
Pattern making	0.03	0.02	0.02	0.07
General	0.30	0.10	0.39	0.79
Total	2.69	0.60	2.55	5.84

It is from such a summary that ratios, or percentages of total expenses to molding labor, are obtained. For example, we have the ratio of total Manufacturing Ex-

pense to Molding Labor, 5.84 to 1.03, or 5.67. A foundry having such a ratio could use 6 for this item in making up an estimate on castings which may be considered perfectly suitable to its plant and equipment and its class of labor and general organization. This ratio, however, assumes that all pieces are cored. Estimates on plain work under this plan would drop the item of coremaking from the summary giving a new ratio, and a lower estimated cost. Estimates on difficult cored work might double the coremaking item, but would retain the standard ratio of Manufacturing Expense to Molding Labor. From such a table several valuable ratios may be obtained.

The supplies for the melting, molding, coremaking and cleaning departments are further subdivided from month to month, the costs being carried on the page with the summary. These items include refractories, coke and oil, crucibles, sand, compounds, oils, saws, files, etc.

BUILDINGS AND EQUIPMENT.

Any labor which the foundry applies to the upkeep of its buildings and equipment is charged to these accounts. Such labor carries with it certain materials (referred to as supplies above), as shown by requisitions. This labor should carry also its share of the Overhead, proportional to the dollars of labor applied. In turn the depreciation applied to Buildings and Equipment is carried into Overhead each month, to be charged to the various items of Manufacturing Expense, as shown in the summary. Expenditures for buildings erected by contract, or for equipment by purchase, are charged to these accounts in the same way, and charged out regularly to Overhead.

ESTIMATING.

The factors that enter into any estimate are shown in the following example:

Metals	30.00 cts. per lb.	
Melting loss	2.40	32.40
Molding labor	1.10	
Manufacturing ratio	6	
Manufacturing expense	6.60	6.60
Selling expense	1.20	1.20
Sale cost		40.20
Sale price (basis 10% profit)		44.00

The metals are figured on the basis of market quotations at the time. The melting loss assumes a 4 per cent. loss in the furnace, with a 50 per cent. yield of good castings. The molding labor has been estimated from a yield of 500 pounds for $5.50, direct molding cost. The ratio of 6 has been found to be correct for the foundry in question, within reasonable limits. The Selling Expense is the average selling expense, per pound, for the past six months.

METHOD OF DIRECT AND INDIRECT ITEMS.

Under this plan, which is given in full detail, the various items of cost, such as molding labor, are grouped, to bring out clearly those which respond directly to a change in tonnage; and to throw into the background such items as clerical help, which are fairly constant for the period. These items are listed here, subject to increase, to meet the needs of any particular foundry. Certain numbers are left blank for future use.

METALS.

1A. Purchased metals.
1B. Foundry scrap.

PRODUCTIVE LABOR GROUP.

2. Molders (including helpers).
3. Coremakers (including helpers).

TONNAGE GROUP.

4. Melters (including helpers and pouring crew).
5. General labor (wheeling sand, coke, castings, etc.).
6. Repair labor (furnaces only).
7. Crucibles.
8. Fuel (oil, coke, gas).
9. Charcoal.
10. Refractories (furnace, brick, clay, etc.).

GENERAL EXPENSE GROUP: Molding.

11. Foremen (except coremaking).
12. Clerks (not including office clerks, or shippers).
13. Cleaners.
14. Inspectors.
15. Repairmen (ordinary repairs).
16.
17. Molding sand.
18. Other supplies.
19.
20. Molding's share of General Expense.

GENERAL EXPENSE GROUP: Coremaking.

21. Core room foreman.
22. Core room supplies.
23. Coremaking's share of General Expense.

OVERHEAD EXPENSE.

24. This item comprises light, heat, power, rent, insurance, taxes, office salaries, superintendents, watchmen, shippers, etc., office expenses and depreciation.

Overhead expense (24) is divided between Molding and Coremaking (items 20 and 23) in proportion to the dollars of labor for items (2) and (3).

BUILDINGS AND EQUIPMENT.

25. Extraordinary repairs, renewals and improvement to plant made by the organization's own labor, together with the necessary materials, are charged to this item. Depreciation of this item is regularly charged to Overhead Expense (24).

SELLING EXPENSE.

26. This account includes salaries of the salesmen, traveling expenses, advertising, outbound freight, cartage, entertaining, bad debt reserve, commission reserve, discounts, etc.

ILLUSTRATION OF A COST STATEMENT.

For the month of———————

METALS.

Metals consumed to make 70,000 pounds good castings (value) $20,552.00.

This account is the total of all the different alloys made. It might cover the following items:

Alloy No.	Amount Charged.	Good Castings.	Bad Castings.	Gates and Risers.	Melting Loss.
1	33,900	19,000	2,000	12,000	900
2	49,400	30,000	3,000	15,000	1,400
3	13,400	8,200	800	4,000	400
4	15,500	9,000	1,000	5,000	500
5	6,000	3,800	400	1,500	200
Total	118,200	70,000	7,200	37,600	3,400

From this we have, averaging all metals:

118,200 lbs. metal charged	@	28.0 cts.	$33,096.00
Credit 7,200 lbs. bad castings	@	28.0 cts.	2,016.00
Credit 37,600 lbs. Gates and Risers	@	28.0 cts.	10,528.00
73,400 lbs. metal consumed	@	28.0 cts.	20,552.00
70,000 lbs. good castings	@	29.36 cts.	per pound

It is important to notice that each alloy has its own metal cost, and that the above illustration has averaged all of these metals to show the total consumption for the period.

MANUFACTURING EXPENSE.

The Manufacturing Expense items enumerated above, are summarized as follows:

Productive Labor, item 2	$ 700.00
Productive Labor, item 3	200.00
70,000 lbs. Good Castings, made @ 1.28 cts.	$900.00
Tonnage Group, items 4 to 6	$300.00
Tonnage Group, items 7 to 10	200.00
General Expense Group, items 11 to 15	300.00
General Expense Group, items 16 to 20	200.00
General Expense Group, items 21 to 23	150.00
70,000 lbs. Good Castings, made @ 1.64 cts.	$1,150.00
Total 70,000 lbs. Good Castings, @ 2.93 cts.	2,050.00

The *average* manufacturing cost of 70,000 lbs. of castings is then

Metals	$20,552.00
Manufacturing Expense	2,050.00
Total	$22,602.00

The *average* manufacturing cost per pound is 32.29 cents.

Castings made during this period will have an average Manufacturing Expense of 2.93 cents per pound; each alloy will have its own metal cost, and its own melting loss. An inventory of the castings on hand at the end of any period should consider this fact. If the foundry makes but one alloy, the average metal cost may be applied, but only in this case.

SUMMARY.

In summarizing, it is assumed that depreciation has been charged to Expense, and that the Selling Expense for the month amounts to $1,000.00.

Castings on hand at first of month 5,000 lbs.	$ 1,500.00
Good castings made during the month 70,000 lbs.	22,602.00
Total @ 32.00 cts. per pound 75,000 lbs.	$24,102.00
Good castings not shipped at end of month 10,000 lbs.	3,200.00
Castings shipped 65,000 lbs.	$20,902.00
Castings invoiced 65,000 lbs.	$23,990.00
Manufacturing cost of castings 65,000 lbs.	20,902.00
Gross profit	$3,088.00
Selling expense	1,000.00
Net profit for the period	$2,088.00

ESTIMATING METALS AND PRODUCTIVE LABOR.

It is good practice to quote on the basis of the average price of metals prevailing during the month, except when quoting on future scheduled deliveries when metal quotations for those periods may be used. It is not good practice to quote on the basis of metals purchased, unless the purchase prices happen to be the prevailing prices. If a record of the melting loss has been properly kept, each alloy will show an average loss in the furnaces common to the equipment. Often the alloys may be grouped as bronzes (88-10-2 and 80-10-10 and similar alloys), red brass (85-5-5-5, etc.), and yellow brasses (60-40, etc.).

An inquiry calls first for an estimate of the castings that a moulder will make for a day's wages. Laying out the pattern on a plate for a 12 in. x 18 in. flask (for example) will show the number of castings that can be handled in the flask, and also the approximate weight of sprue, gates and risers. We may assume for illustration that we can get two castings in the flask, on a plate, and that they will weigh 25 pounds (12½ pounds each); the sprue, gate and head running 20 pounds. Assuming a metal cost of 28 cents per pound (from the market quotation), and assuming further that one moulder will make 80 flasks, we have a gross output of 2,000 pounds of castings, with 1,600 pounds of gates and heads. The molder's rate may be $4.80 for 10 hours, and the helper's, at $3.00, are in such number in the shop that ½ helper is chargeable to each molder, we have for productive labor a charge of $6.30 for 2,000 pounds.

Anticipating a 10 per cent. rejection by the inspectors we have:

Molding 1,800 lbs. made for $6.30 ..... 0.35 cts. per lb.

In like manner, we might have for the cores in these pieces:

Coremaking 1,800 lbs. for $1.80 ..... 0.10 cts. per lb.

In the illustration it is evident that we have poured 3,600 pounds of metal, obtaining 1,800 pounds of good castings. Assuming a 4 per cent. metal loss in the furnaces we have an 8 per cent. metal loss on the good castings. We might have then:

Metal (80-10-10)	@ 28.00 cts. per lb.
Metal loss 8%	2.24 cts. per lb.
Productive labor, molding	0.35 cts. per lb.
Productive labor, coremaking	0.10 cts. per lb.

TONNAGE GROUP.

Items 4 to 10 are fairly constant in dollars, and in cents per pound under what may be termed normal conditions. This figure should be averaged for six months continuously, the oldest month being dropped as the next month is added.

GENERAL EXPENSE GROUP: Molding.

We might have for any foundry, a tonnage group cost of 1.50 cents per pound. Items 11 to 20 have shown, through the same period as for the Tonnage Group, a fairly constant ratio to Productive Labor. Molding. It might average 150 per cent. of molding labor. In the illustration in question, molding labor is 0.35 cents per pound. In this case the General Expense Group: Molding, would be 150 per cent. of 0.35 cents or 0.525 cents per pound.

GENERAL EXPENSE GROUP: Coremaking.

In like manner General Expense Group: Coremaking, might be 200 per cent. of Productive Labor, Coremaking, in which case this particular estimate would call for 200 per cent. of 0.10 cents per pound or 0.20 cents.

This estimate may call for special equipment all or part of which may be incorporated in the costs. For illustration we may assume that this covers patterns, flasks, etc., and amounts to 0.10 cents per pound.

SUMMARY.

Summarizing we have:

Metals (80-10-10)	28.00 cts. per lb.
Melting Loss 8%	2.24 cts. per lb.
Productive Labor: Molding	0.35 cts. per lb.
Productive Labor: Coremaking	0.10 cts. per lb.
Tonnage Group	1.50 cts. per lb.
General Expense Group: Molding	0.525 cts. per lb.
General Expense Group: Coremaking	0.20 cts. per lb.
Extraordinary Expense	0.10 cts. per lb.
Manufacturing Cost	33.015 cts. per lb.
Selling Expense	1.200 cts. per lb.
Sale Cost	34.215 cts. per lb.
Selling Price (5% basis)	36.000 cts. per lb.

The Selling Expense is an average obtained under normal conditions. Any Extraordinary Selling Expense should be added, as in the case of special tools and equipment.

BORONIZED METALS: SOME MINUTE ASPECTS

An Investigation of the Merits of Boron as a Deoxidizer in Alloy Preparation.

Written for The Metal Industry by James Scott.

Much interest and curiosity has been evinced in metallurgical circles respecting the use of boron in connection with the production of alloys, very promising results having been obtained; and these improvements are very likely to be much extended as the particular value of the new factor in this particular direction becomes fully recognized.

It will be profitable to consider the constituents of this alloy, and the details will provide a sufficient reason for its pronounced success.

Boron, symbolized as B, with an atomic weight of 11, is an element which, like carbon, is allotropic, and thus occurs in neatly-formed octahedral crystals and as an amorphous powder of a dull greenish brown color.

It has a strong affinity for oxygen, and on this trait depends to a great extent its utility as a deoxidizer; definite phases of which are specified further on in these notes. When sufficiently heated while wholly exposed to the air it burns, attracts oxygen, and is converted into the white powder known synonymously as boric and boracic acid, which is so widely favored as an antiseptic.

Unlike the majority of other acids its corrosive power is so feeble as to be practically negligible; the reason that there appears to be no danger of any defects being set up by the incorporation of boron in melting alloys.

The importance of borax as a flux in operations dealing with molten metals is well established. This substance is a compound of boric acid and soda, and is designated sodium, or soda, bi-borate. It contains the element boron, the modifications of which are obviously innocuous.

Native borax, there called tincal, is found in the hot lagoons and geysers of volcanic regions, more especially in Tuscany. It incessantly bubbles up from the earth through fissures of subterranean origin, and forms surface pools, or else is absorbed by the water already present. Crusts of the evaporated compound are abundant. It is derived in large quantities from these sources by a very clever system.

The mineral boracite, which is a borate of magnesia, also contains the element boron, and the latter can be extracted from it.

Boron oxide (that is, boric acid) is formulated as BO_3. Boron is procurable by eliminating oxygen from this substance, which can itself be obtained from borax. But it does not follow that this method is the one invariably practiced by manufacturers.

It is a very remarkable fact that boric acid can be heated quite intensely without vaporizing; whereas, when it is in the condition of solution, after being dissolved in water, it readily passes away in the steam produced by boiling. This behavior tends to prove that when boron is contained in a metal it is not likely to become gasified. Indeed, its merit for preventing the development of blowholes is doubtless due to this refractoriness. It not only fails to generate permanent cavities itself, but attracts risky fumes which might otherwise get imprisoned in the solidified metal as scattered porous spaces. It also explains why a boronized alloy, when remelted, retains its capacity for combining with oxygen, and so keeps it from interfering with the metal.

Strangely enough, boron, as such, has been until recently (speaking in a comparative sense) regarded in the light of a substance of no special commercial account; although its compounds have for a long time been highly useful. The discovery of its value for the purposes now described, however, confers incalculable appreciation upon it.

Boronized metals and alloys have not been very much investigated, so that a fairly fresh field for research is open to anyone who feels inclined to study the properties and possibilities of such substances. It is certain, judging from reports received from prominent manufacturers who have successfully tested boron products, that the future will see some very striking applications of these alloys. The improvements fostered by the initial combination of boron with metals are easily verifiable by con-

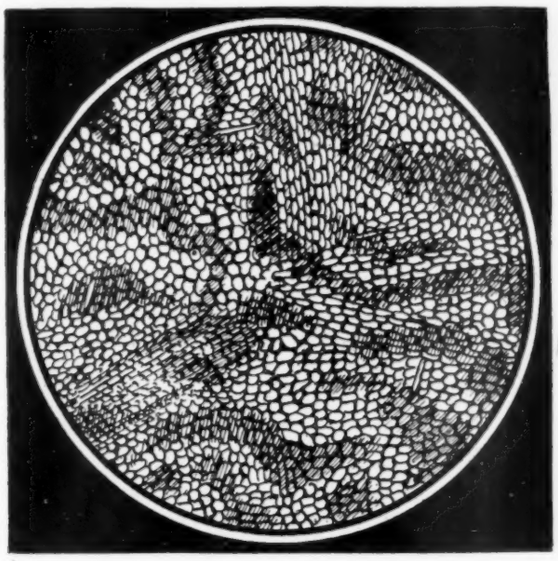


FIG. 1.—A SPACE ABOUT 1/24-INCH WIDE, MAGNIFIED, SHOWING THE SUPERFICIAL TEXTURE OF BORON-ALUMINUM.

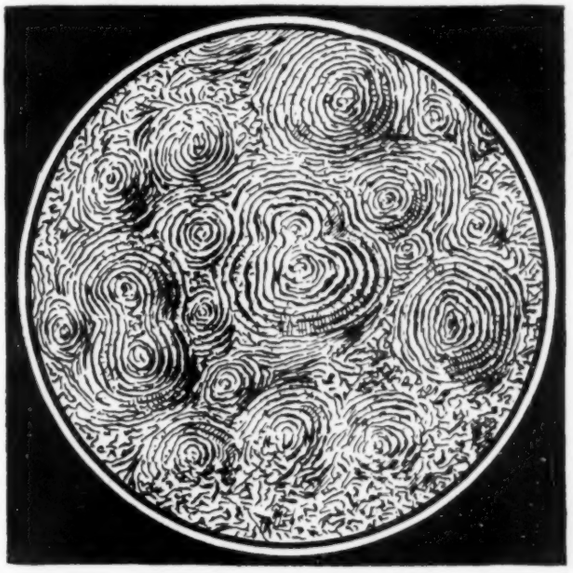


FIG. 2.—A SPACE ABOUT 1/24-INCH WIDE, MAGNIFIED, SHOWING THE SUPERFICIAL TEXTURE OF BORON-COPPER.

trasting them with the same metals untreated by it; so that there is no need for men to trust blindly to mere statements on the subject. Controlled experiments, conducted in either small laboratory practice or on a gigantic foundry scale, furnish the same results namely, increased value when boron is adopted. It is probable that its use causes the appearance of various metallic borides of great tenacity and strength.

Readers are fully aware of the costliness and trouble entailed by the burning or oxidation to which many molten metals are liable, and therefore they will not require any emphasis from the author on that point. Aluminum can oxidize to a white or grey granular earth; copper to reddish or black oxides in scales or flakes; and nickel to grey and black powders. Minutely considered, dispersed oxides have various colors; but it is not possible here to go into details. Boron is intended to prevent these inherent faults, by taking the oxygen to itself. In doing so, it seems to add to the quality of the metal by its presence in the newly-combined state.

Charcoal (carbon, that is) attracts oxygen, and serves as a deoxidizer; but it then yields the gases carbon monoxide and carbon dioxide, which may (*if the medium is used in excess*) permeate the molten metal, and be responsible for the evolution of small and large blowholes. Boron, instead, when oxidized in a similar manner, yields compact constituents.

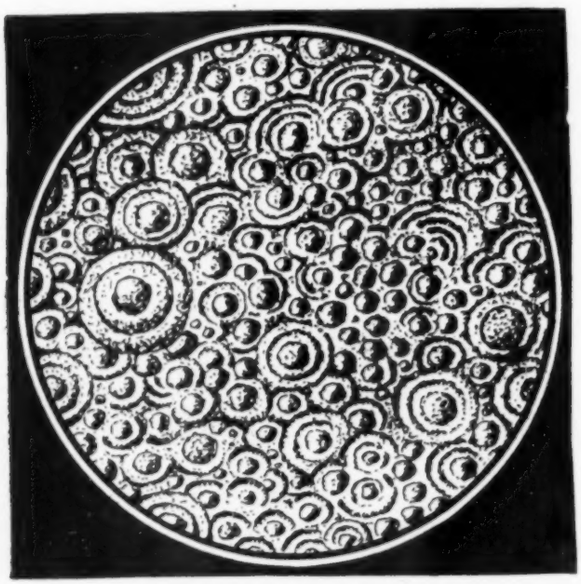


FIG. 3.—A SPACE ABOUT 1/24-INCH WIDE, MAGNIFIED SHOWING THE SUPERFICIAL TEXTURE OF BORON-COPPER-NICKEL.

For the purpose of illustrating this article the author microscopically examined the three most commendable boron alloys; namely, aluminum, copper, and copper nickel; they were handled just as they came from the smelter; and were not chemically etched in any way. As thus received, they were intended to be remelted with bulkier quantities of either fresh metal or scrap, with the object of preventing oxidation and corresponding waste. At the same time, the boron alloys harden and toughen these other metals, and benefit them in many ways which, while plainly evident, are not easily described. Only small percentages of boron alloys are necessary to improve other metals to surprising degrees. After all, the best test is that of actual use; and so far as can be gathered nothing but satisfaction resulted from the use of boronized metals.

It can be well understood that the more minutely uniform a purifier happens to be, the better are its chances for giving satisfaction and producing advantages in a molten metal to which it is added. Unless there is perfect blending weak areas will alternate with stronger ones, and the strength become limited by the former.

The precise form in which boron is now used for the purification of metals is as a fluoride, which is a gas belonging to the series of boron halides. *Experimentally*, this gas, $B F_3$ (a very heavy, transparent one), can be prepared by heating one part of fused boric acid, two parts of fluor spar (calcium fluoride) and twelve parts of sulphuric acid together. It has to be collected in a flask over mercury.

It is not proposed to trace its possible reactions in the molten and solidifying metals. Most of its behavior probably depends on the acidic or oxidizing power of the boron element during a series of conversions. It is in this direction that much research is needed.

Boron aluminum is in the form of small, light, grotesquely-shaped modules, while boron copper consists of dense, pill-like objects, and boron nickel as roundish buttony pieces. Their surfaces present nothing very striking to the naked eye, but proper magnification in a suitable light reveals very fine textures. It is advisable to focus the brighter portions and assist observation with brilliant illumination. When this is done the appearances are as follows (see illustrations):

In Fig. 1 is shown a view of boron-aluminum. This is very finely granular, and slightly wavy. In some portions the particles tend to arrange themselves in parallel rows, a few of them having fused together into almost crystalline prismatic objects. The general structure is quite neat and perfect, and there do not appear to be any latent defects.

In Fig. 2 a view is shown of boron-copper. In this case the boiling metal has settled with its bubbles solidified with concentric layers or folds, giving a laminated pattern to it. There has been no chance for any of the globules to remain in a hollow, holey state.

In Fig. 3 is shown a view of boron-copper-nickel. The frothing mass has subsided as picturesque, intact and blended spheres and discs devoid of perforations.

All these phases merge into delicate filigree in many areas of compact form. These examinations make it possible to understand why boronized metals possess considerable superiority over other kinds.

UNITED STATES GOLD FLOOD.

Mr. George E. Roberts, a former director of the United States Mint, speaking at a recent luncheon, said that "the United States are far and away the richest country in the world to-day. Our wealth is more than that of Great Britain and Germany combined." He warned his hearers, however, that American capital would have to be advanced for the development of foreign countries, if the United States were to maintain this economic leadership. Mr. Roberts explained that the effect of the flood of gold into this country would be to raise wages and materials and all the costs of doing business, until the larger amount of money would be employed in doing the same volume of business. Destruction of life and property in the warring countries, according to Mr. Roberts, are compensated to a large degree by a tremendous stride forward in industrial organization and efficiency, due to the war. Mr. Roberts predicted a period of general business readjustment at the conclusion of the war, with a large movement of gold out of this country.

DETERMINING WEIGHT OF DEPOSIT*

SOME VALUABLE SUGGESTIONS FOR THE CHEMICAL DETERMINATION OF ELECTROLYTICALLY DEPOSITED METAL.

WRITTEN FOR THE METAL INDUSTRY BY L. C. WILSON.

(Concluded from December, 1916.)

ESTIMATION OF LEAD.

The possibilities which a coating of lead presents in the way of a protective finish for iron and steel have long been recognized, but it is only comparatively recently that it could be plated with any sort of success, at least in a commercial way. Exhaustive investigations on this subject have brought many important facts to light, however, and a very considerable advance has been made so that it is now possible to produce fairly satisfactory lead deposits and these are finding a constantly increasing use. It is necessary, therefore, to have some means of determining the weight of coating applied.

Lead is familiar to everyone as a soft and very heavy metal, having a specific gravity of 11.37 and melting at 327.7 deg. C. It is malleable, very slightly ductile and, although it tarnishes readily enough in the air, becoming covered with a thin layer of oxide or carbonate which protects the underlying metal from further action, it is markedly resistant to the action of alkalis and most of the strong acids; nitric acid alone attacks it vigorously and is its best solvent. It is this practical immunity from attack by the various destructive agencies and its general inertness under adverse conditions which give it its value as a protective finish.

Lead, like all of the other metals, may be determined in several different ways, each of which may present certain advantages under different conditions. The electrolytic method, in which the lead is precipitated out of an acid solution by the electric current, is often employed but unlike the metals which have been considered so far it is not deposited in metallic form on the cathode, but it appears on the anode as the peroxide instead; this makes no particular difference to us, however. One advantage of this method is that manganese is the only one of the ordinary metals which interferes with the analysis and as it will hardly be found in work of the character in which we are interested there is little to fear on that score. There is one unfortunate tendency which may be mentioned, however, namely, that with large amounts of lead in the solution trouble is sometimes experienced in getting the lead peroxide to adhere to the electrode; it tends to flake off, making the results too low. The use of a fairly high current density, a strongly acid solution and deposition on a gauze electrode are the usual means of overcoming the trouble.

In practise, therefore, the nitric acid solution, it should contain from 15-30 per cent of free acid, of the metal is transferred to a tall beaker or electrolyzing dish, diluted to about 150 cubic centimeters, the previously cleaned and weighed electrodes introduced and the apparatus connected up, this time making the gauze positive or anode, instead of cathode as usual. When the outfit is so arranged that the anode may be rotated a current of 2-2.5 amperes per square centimeter of active cathode surface may be used, but with a stationary anode a somewhat lower current, 1-1.5 amperes is employed.

When the deposition of the lead peroxide is complete, which will require several hours, the electrolyzing beaker is lowered away from the electrodes without breaking the current; these are then rinsed off in a beaker of distilled water, the anode dipped in strong alcohol, then dried at a temperature of 220 deg. F. for fifteen minutes, cooled and weighed.

Since the deposit is lead peroxide instead of lead the weight obtained must be multiplied by a factor, .8643, in order to find the weight of metallic lead.

One of the important methods for the estimation of lead, and which finds a wide use, depends on the insolubility of the sulphate, particularly in water containing a small amount of sulphuric acid and alcohol.

The procedure consists in adding a few cubic centimeters of strong sulphuric acid to the solution containing the lead and evaporating, generally over a free flame, shaking the flask meanwhile with a whirling motion, until dense, white fumes are given off; this insures the removal of any acids which were present in the solution and might interfere with the precipitation of the lead. The solution containing the white lead sulphate is then cooled, diluted with about 50 c.c. of water and heated to boiling to dissolve any soluble sulphates and finally filtered through either a weighed Gooch crucible or a paper filter, washing the precipitate thoroughly with water containing about 1 per cent alcohol and the same amount of sulphuric acid, finishing with alcohol alone, to remove all acid.

If the Gooch crucible was used it should be supported in a larger crucible by pushing it half-way through a hole cut in a piece of asbestos resting on the top of the other crucible; the latter should then be heated for 5-10 minutes with a bunsen burner. The Gooch crucible is then cooled in a desiccator and weighed.

When a paper filter is used the precipitate and filter are dried at a temperature of 212-220 deg. F., the precipitate carefully detached and brushed into a weighed porcelain crucible and the paper burned in a platinum wire spiral, or held in a pair of tongs above a crucible cover or watch glass and burned. The ash collecting on the glass or cover is then brushed into the crucible with the rest of the precipitate. The burning carbon of the paper always reduces some of the lead sulphate to the metal, so a few drops of nitric acid are added and the excess evaporated off, then the precipitate is moistened with a drop or so of sulphuric acid and the crucible gently heated until no more fumes are given off, then cooled and weighed.

Whichever form of filter is used the product is the same, lead sulphate, the weight of which must be multiplied by .6831 to obtain the actual weight of lead.

For those who prefer a volumetric method, and in certain ways such a determination has a good deal in its favor, what is known as the molybdate method may be employed. In this the original acid solution of the lead is precipitated with sulphuric acid, evaporating over a flame until white fumes are given off freely, as before. The solution is then cooled, diluted with water and filtered, washing the precipitate with hot water containing about 2 per cent of sulphuric acid, finally washing once with a small amount of cold water. The precipitate is washed or transferred to a beaker and 25-50 c.c. ammonium acetate solution, 20 grams of the salt to 100 c.c. water, added and the whole boiled if necessary to take everything into solution. If a residue remains after this treatment it is filtered off and washed with hot water. The filtrate or solution is then made slightly acid with acetic acid and is then ready for titration with the molyb-

*Descriptions and illustrations of the apparatus needed to carry out the analysis described in this article are contained in articles by the same author, published in May, August and December, 1914.

date solution. This is run in, with thorough stirring, until a drop of the solution gives a yellow color when placed on a drop of tannic acid solution on a spot plate or sheet of white paper.

The molybdate solution is prepared by weighing out exactly 8.64 grams of ammonium molybdate, dissolving in distilled water and diluting to one liter. It is always necessary to determine the actual strength of the solution and this may be done by weighing out two or three samples of pure lead foil, .25-.35 grams each, and dissolving each in about 15 c.c. nitric acid diluted with its own volume of water. When all is in solution, enough dilute sulphuric acid, one part acid to one part water, is added to precipitate all of the lead as sulphate. The precipitate is allowed to settle and the solution poured through a filter, keeping as much as possible of the precipitate in the beaker, washing several times with water containing about 2 per cent of sulphuric acid, finally with a little cold water, to remove all acid.

The precipitate on the filter is dissolved by pouring a hot solution of ammonium acetate, mentioned above, over the filter several times, at last washing with hot water. The precipitate remaining in the beaker is then dissolved in the ammonium acetate, the solution made slightly acid with acetic acid, diluted to 200 c.c. and titrated with the molybdate solution, using a solution of tannic acid, .3 g. in 100 c.c. water, as an outside indicator.

Each cubic centimeter of the molybdate should be equivalent to .01 gram of lead, but it may be of greater or less strength; in any case dividing the weight of lead foil taken by the number of cubic centimeters of solution required will give the value of the solution in grams of lead. Thus if .35 g. of lead were taken and 36.4 c.c. of solution needed for titration, $.35 \div 36.4 = .0096$, or each cubic centimeter is equivalent to .0096 g. lead.

The application of these methods to the examination of plated parts follows broadly the directions given in the preceding articles covering the determination of the other metals. The coating must be stripped off and dilute nitric acid is used for this purpose, since it attacks lead more readily than do the other acids. Unfortunately, iron is also very soluble in nitric acid and a considerable amount of it will usually go into solution and may have to be removed.

Ordinarily iron, at least in reasonable amounts, does not interfere with the electrolytic method so if only a small amount is present it is probably safe to electrolyze the solution without further manipulation, except to see that it contains from 20-30 per cent. nitric acid and is of about 150 c.c. volume.

When excessive amounts of iron are present, the nitric acid solution of the lead is evaporated to heavy, white fumes with sulphuric acid, the solution cooled, then diluted and boiled and the lead sulphate finally filtered off, as described above. The precipitate is transferred to a beaker and ten or fifteen c.c. of a warm saturated solution of ammonium carbonate poured through the filter into the beaker, washing with a small amount of water. The solution should now be warmed until all of the lead sulphate is converted to the carbonate, which may then be filtered off on the same filter, washed with water until the ammonium carbonate is removed, and dissolved in about 40 c.c. dilute nitric acid, one part acid to three parts water. All lead is removed from the filter paper by pouring some of the dilute acid through it and washing with water, allowing the washings to mix with the rest of the lead solution; the latter is finally electrolyzed as directed above.

With the molybdate method it is always necessary to remove all of the iron, since this metal gives a conflicting color reaction with the tannic acid used as indicator.

The coating is stripped as before in nitric acid, the solution allowed to cool and enough sulphuric acid added to precipitate all of the lead as sulphate, then evaporated over a flame until heavy, white fumes come off. The flask and its contents are cooled, diluted with distilled water and the rest of the determination carried out as given under the molybdate method above.

Trouble is liable to be experienced from the slight traces of iron retained by the lead sulphate precipitate, so it is best to remove these by pouring a mixture of 5 c.c. dilute sulphuric acid, one part acid to ten parts water, and 15 c.c. hydrogen sulphide water over the sulphate on the filter, finally washing with cold water. The filter and precipitate are then placed in a flask with 5 c.c. strong hydrochloric acid and boiled over a flame to convert the sulphide to chloride; more acid may be added if necessary.

Most of the acid is removed by evaporation, then a few drops of nitric acid are added and the solution heated for a moment. After cooling somewhat 25 to 50 c.c. cold water are added with a few drops of litmus solution, or piece of litmus paper, then ammonia to slight alkalinity. The solution is then made distinctly acid with acetic acid, heated to boiling, diluted to 200 c.c. with boiling water and titrated with the molybdate solution.

As might be expected, the manipulation with the gravimetric method is somewhat less than the foregoing. The nitric acid solution in which the coating is stripped is precipitated with sulphuric acid and the lead sulphate filtered off and washed as before. Finally the filter and precipitate are dried, preliminary to separating them and burning the former, although it is possible to omit this step and burn filter and all at a very low heat, afterward moistening with nitric acid, then sulphuric, or even the latter alone, gently heating to expel the excess, cooling and weighing. When the washing and burning of the filter are carefully done the error introduced by the presence of the iron which is retained and by the reduction of the sulphate by the burning filter will usually not affect the results seriously and will prove satisfactory for work of the present character, where absolute accuracy is not required, nor any particular attempt made to secure it.

(The End.)

COPPER-CLAD WIRE.

According to recent reports, copper-clad steel wire is in growing demand. The wire is finding its way into the electrical industries for certain purposes where wire cost and strength are important considerations. The new wire possesses a steel core with a welded copper jacket. This costs less per pound than whole copper wire, and is 7 per cent. lighter, size for size. The manufacturers state that it is stronger than copper, and therefore smaller diameters can be used, gives better service, costs less to maintain, and so on. Undoubtedly it is useful in many respects.

MELTING NON-FERROUS SCRAP.

Although it is possible to melt non-ferrous scrap of small size without much waste, it is preferable to form the stuff into briquettes when fairly large quantities are available. This prevents metal loss, and it enables one to charge the crucibles fully having to feed them with fresh supplies. Usually some kind of agglutinant has to be used, and special pressure is applied by means of briquette machines.

THE ART OF ENGRAVING AND EMBOSSING

An Exhaustive Article Dealing with the Production of Artistic Effects in Metal Work

Written for The Metal Industry by Easy Way.

(Continued from December, 1916.)

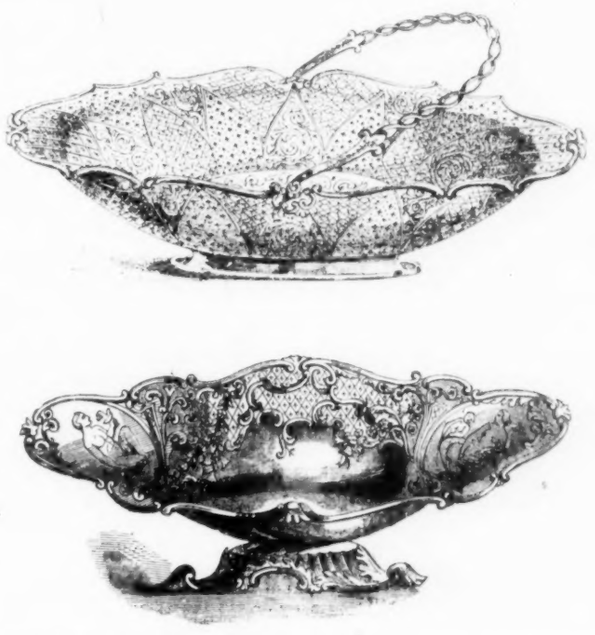
REPOUSSÉ ENGRAVING.

There are specimens of the Japanese art which, due to the minute detail, are often taken by a novice as mere plain forms, and to the less observant it would be wise when inspecting art of this class to scratch or knock the side of the head to see "if any one is at home," because the Japs' cleverness is excelled by very few rivals. The wonderful patience of the Japs in the perfection of their damascening and inlaid work is almost superhuman and their skill at producing saw work, as the profiles of human beings, animals and many other conventional designs, is even superior to the very fine class of detail work necessary to produce gold coins, bank bills or treasury notes.

It is very necessary that any one attempting the art of repoussé work or engraving should have a gift for and understand drawings in order to carry out their impression, and with that very special requirement mastered they must remind the workmen that they must be very careful in handling the tools if the contingency of cut figures or damaged work is to be avoided. The left hand has nearly as much to accomplish as the right when engraving, only in a different way. Both hands, however, may be described as opposing each other in force. The right hand is used for pushing the tool forward and for turning it this way and that way and in fact does most of the guiding. The pressure on the tool from the right hand should be resisted by the left until almost a balance is obtained and just enough force should be left to incise the metal gently without danger of slipping forward and damaging the metal or the fingers. The tools are thus in complete command and the slightest change of pressure on either hand may alter their direction or stop them at once. Never force a tool forward with one hand without this counter resistance as there is no knowing what may happen if it slips. Also never exert too much force on a tool when in the neighborhood of a delicate passage, but take time and eat the metal out mouse-like. In order to make the lines and curves easily and readily the elbows should be held away from the body so any sweep can be given the tools and work then with the forefinger on top of the tool as a guide with the handle safely lodged in the palm of the hand. This provides a typical method of making the cuts.

As its methods are so simple and elemental and distinctions so few that such limitations will be recognized and the submitted design will be made the most of, instead then of trusting to a forced variety let us seek for its strong point in an opposite direction and by the monotonous repetition of basket-like design win the not-to-be-despised praise which is due to patience and perseverance. In this way only can such a restricted form of artistic expression become in the least degree interesting. The designs usually associated with the modern practice of this work are known as "geometric" and are composed of circles and straight lines intersecting each other in complicated patterns. The variety obtained in this manner, as contrasted with the dignified monotony of the simpler method, is the note which marks a weak desire to attain great results with little effort as to the variety. This is wholly mechanical. The technical difficulties with modern tools at command are felt at a glance to be very trifling, therefore such designs are quite unsuitable to the kind of work if human sympathies are to be excited in a reasonable way. An important fact in connection with this kind of design is that most of these geometric patterns are, apart from their uncomfortable variety, based on too large a scale as to detail. All the laborious works, such as may be seen in museums, are founded generally upon a scale of detail in which the artists have not permitted themselves to work, but being confined to the geometric principles only in special places of a subtle change in their alternate emphasis with perpendicular and horizontal lines for borders, etc.

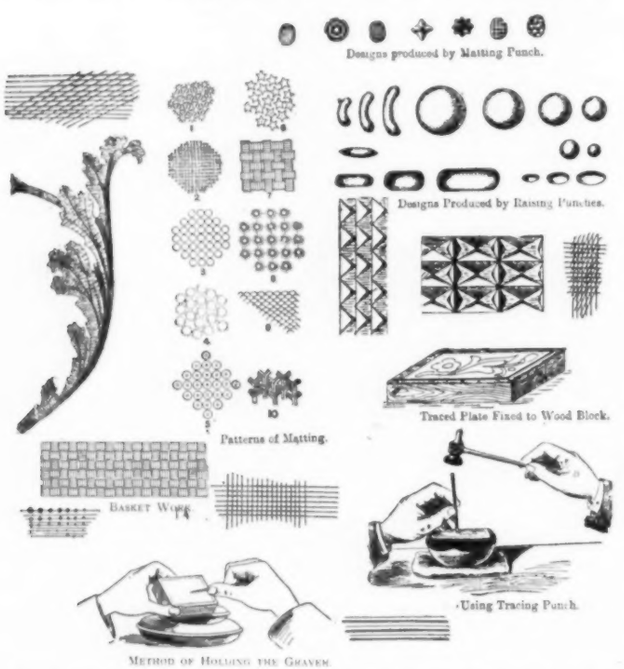
For a beginner and as a test of endurance for an experimental effort with a graver, these patterns are presented for exercise. Pencil and incise the metal until its entire surface is covered by repeating the same design over its entirety. By the time it is completed the engraver will begin to understand the fundamental qualities and appreciate what is necessary toward the making of an engraver, namely: patience, which, when mastered, will return very pleasant surprises in the unexpected but very natural admiration it elicits. To ground the metal for the design and produce a dead even yellow, a dabber of cloth filled with wadding is moistened, then gum gamboge is dabbed on the metal, which also must be moistened and evenly spread with the dabber. The metal should then be allowed to dry and the pattern can be readily drawn with a pencil, after which the metal is traced through the ground with a pointed needle. Then the ground is washed away and the pattern ready to be engraved. If, for any reason, the gum gamboge cannot be purchased, cover the metal with a very thin film of grease and dust over it a similar coat of pulverized chalk; then proceed with the pencil and steel



EXAMPLES OF REPOUSSÉ AND DAMASCENING ENGRAVING.

point as mentioned. This method is employed by all professionals and has proven practical in every respect.

When proficient at the foregoing design, two other simple patterns as studies are submitted, one of them without any curves. The plans of the drawings are self-explanatory and the only instruments required for the conventional design are a rule and dividers. This pattern represents a regular hexagon containing two triangles and a six-cornered star in the center, showing the method of obtaining the design and, on closer examination, it will be seen how the various lines are set out. In making the cuts the precise angle at which the graver is inclined to the metal is not of much consequence, but it should be as uniform as possible. The hand will be so accustomed to cutting at the same slope or nearly so that the same difference in depth is hardly noticeable. As far as possible the cuts should be made clean and to the required depth in one operation. This, however, is often impracticable and it becomes necessary to make more than one cut to get to the bottom. When this has to be done the utmost care should be taken that the second and succeeding cuts are exactly at the same angle as the first, because, if not, the cut or rather that particular side of it will show a ridge whenever the cut has been unequal instead of being quite smooth. The irregularity may be nursed away afterwards, but to do this is a waste

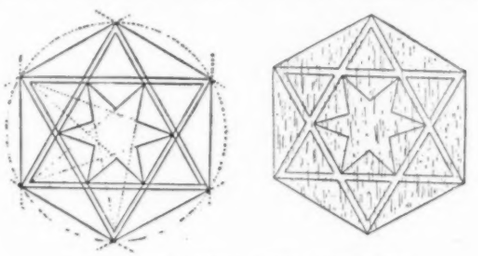

Designs produced by Matting Punch.
Designs Produced by Raising Punches.
Traced Plate Fixed to Wood Block.
Patterns of Matting.
Basket Work
Using Tracing Punch.
Method of Holding the Graver.

SOME SIMPLE PATTERNS PRESENTED FOR EXERCISE WITH THE GRAVER.

of time and work seldom looks so clean and trim as if accomplished properly at first. Perhaps the beginner may be inclined to think it would be easier to start cutting away from the center outward, gradually increasing the size till the outline is reached. At first it may be so, but facility in doing the work will not be obtained so quickly as by beginning boldly on the outline, thus avoiding a dirty patchy look which is seldom pleasing and very objectionable. Therefore, if the design is produced judiciously and patience practiced, the decoration will not represent the splendid artistic taste of a barbarian.

VARIOUS FORMS OF DECORATION.

Other kinds of surface decoration now suggest themselves, because one pattern is generally a modification of another; hence, let us consider a waved design that may be wiggled on either side of straight lines of a border. With the first step toward curious and artistic expressions, the chaotic jumbles of half-formed ideas whirling about produce kaleidoscopic effects which to the beginner look like the most lovely pictures, if they could only be produced on the surface of metal. Let the beginner acquire but the technical department of the art and what is easier than to realize those marvelous dreams.



SOME STRAIGHT LINE PATTERNS.

SIMPLE DESIGN PATTERN CONTAINING CURVES.

Later in his progress it may begin to dawn upon him that this same technical department may not be so very obedient to his wishes, because it may have laws of its own which will change his fairy fancies into sober designs not at all unlike something which has often been done before by others. But let the young man continue to see visions, the more the better, provided they are of the right sort. In the meantime a design of flowers and a few leaves and this surrounded by a border is submitted as a study but should not be copied, because one produced by original thought will assist far better, bearing in mind the points which are to be observed in arranging it and which have for their objects the avoidance of difficulties, likely to be too much for a first effort. These points are somewhat to this effect—the design of the leaves should be laid out flat on a ground surface with no complication of perspective, they should have no undulations of surface, that is to say, the margins of all the features should be as nearly as possible the original surface of the metal.

(To be continued.)

BABBIT SUBSTITUTES.

Formerly the genuine Babbit metal was greatly desired for anti-friction metal, but the high cost of tin caused the Babbit metal to be superseded by the lead-antimony combination. The method of melting, pouring temperature and rate of cooling certainly governs the physical properties of the alloy greatly.

REPORT ON A SERIES OF COMPARATIVE TESTS OF ZINC-BRONZE (88 Cu—10 Sn—2Zn) STANDARD TEST BARS

A Résumé of a Paper Presented at the Cleveland, Ohio, Meeting of the American Institute of Metals, September, 1916.

By C. P. Karr.*

With a view to obtaining further information for the framing of specifications of the zinc-bronze 88 Cu—10 Sn—2 Zn it was decided at a meeting of the Advisory Committee on Non-Ferrous Metals in co-operation with the Bureau of Standards, held April 3, 1915, that several foundries be invited to submit a series of cast-to-size test bars, cast by them from ingots compounded by one of them.

The following instructions were sent out to all the parties taking part in the series of tests, viz.: The Titanium Alloy Manufacturing Company, the Ohio Brass Company, the National Cash Register Company, the Packard Motor Car Company and the Bureau of Standards. In what follows the co-operating parties are designated by the letters A, B, C, D, E.

Preparation of Metal Alloy 88 Cu—10 Sn—2 Zn for Comparative Tests.

MATERIAL.

Copper to best electrolytic copper—furnished by Mr. Antisell, of the Raritan Copper Works, N. J.; tin to be the best brand of Straits Tin; zinc to be the Horsehead brand.

MIXTURE.

Alloy of zinc bronze to be made in any form of crucible furnace.

Charcoal only to be used as a covering in the mixture of the metal—no deoxidizing flux or reagent permitted.

MOLDING.

Sand to be used, No. 2 Albany. In addition for dry sand molding any facing sand or binder may be used which is commonly used in good foundry practice.

Feeding or shrink heads to be used in front of each pattern, as suggested by Mr. Jesse L. Jones and described by Mr. Karr in Report of Work Done at Bureau of Standards in Proceedings of Institute of Metals, 1914.

POURING.

Pouring temperatures to be taken with each heat by means of thermocouple or optical pyrometer; the reading being taken prior to the pouring of the first mold. Pouring temperature should lie between 1,100° and 1,200° C.

PREPARATION OF THE ALLOY.

All the metal required is to be made into ingots by one of the parties hereto, except one complete set of test bars as hereinafter specified, cast from the virgin melt. This initial set of bars will be numbered and recorded for comparison with the remaining test bars made from remelting the ingots.

The remainder of the metal, including the gates and sprue heads from the initial pour, are to be divided into seven portions; two of these portions are to be sent to the Bureau of Standards and one portion to each of the four firms participating.

BARS REQUIRED.

Three bars cast-to-size shape—to be cast in green sand and poured flat.

Three bars cast-to-size shape—to be cast in green sand and poured vertical.

Three bars cast-to-size shape—to be cast in dry sand and poured flat.

Three bars cast-to-size shape—to be cast in dry sand and poured vertical.

Six bars to be cast in chill mold for heat treatment.

All bars to be numbered at both ends, with also an assigned letter to identify maker as A 12, B 4, C 36, etc.

DISTRIBUTION OF GATES, RUNNERS AND HEADS.

The initial heat, poured by the party making up the total amount of the alloy, will contain no gates, risers, runners, heads, nor any remelted metal.

All subsequent heats must be poured from the ingot metal supplied by one of the committee, but to which may be added 25 per cent. by weight of charge, gates, runners and heads received from the initial heat, or, if there are more than two heats, from any preceding heat. In no heat will there be more than 25 per cent. of "remelt" gates, heads, sprues or runners.

AMOUNT OF METAL REQUIRED.

Seven and one-half pounds of metal for each flask, containing three test bars poured vertically.

Ten pounds of metal for each flask, containing three test bars poured flat.

Twelve pounds of metal for each chill mold poured.

SIZE OF CHILL MOLD.[1]

Chill bar itself, 14½" long by 2" wide by 1¼" deep.

The method of manufacture and the distribution of the alloy was as follows:

In accordance with the instructions received, C made up a heat of the zinc-bronze in question by the above method. The total charge of the alloy was 440 pounds, melted in equal parts in two new crucibles in the proportion of 193.6 pounds copper, 22 pounds tin, 4.4 pounds zinc. The metal was melted and drawn from the furnaces in one hour and forty-five minutes, out of which four test molds were poured, one chill cast bar and the balance poured into ingots. After weighing gates, risers, test bars, ingots and chilled bar there was a recovery of 435½ pounds of metal or a loss of 4½ pounds, or 1.02 per cent. on a charge of 440 pounds.

Seventy-eight pounds of the above ingots and remelts were sent to each of three other parties, A, E, D, and 158 pounds of the same kind was sent to party B.

The copper used contained by analysis: copper, 99.9550 per cent.; sulphur, .0058 per cent.; iron, .0039 per cent.; antimony, .0020 per cent.; arsenic, .0010 per cent.; oxygen, .030 per cent. The tin and zinc were not analyzed.

Party A sent 12 sand cast bars, as instructed, and also two test bars cast in a chill mold, and stated that it was impossible to make six bars, as requested, because of shortage of material.

Party D sent 12 sand cast bars and six chilled bars which complied as near as possible with the directions received, and stated that the heads and shrinkers required so much metal that they did not have enough metal to make all the bars as directed.

Party E sent 12 sand cast bars and four chill cast bars. The sand cast bars were all fourteen inches long, and it was necessary to cut the test pieces out of the center of

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[1] The chill mold was open on one side.

each bar in order to place their specimens on the same basis of comparison as the others.

The following chemical analyses of the bars have been made. Nos. C. 23, A. 21, D. 24 and E. 25 were made from chill bars and Nos. C. 18 and B. 2 from sand cast bars:

Number	C. 23	A. 21	C. 18	B. 2	D. 24
Copper	87.9%	88.6%	87.7%	88.2%	88.3%
Lead	trace	.8	trace	trace	trace
Tin	10.2	9.2	10.5	10.0	10.0
Iron	less than .02	very small amount in the balance of the samples.			
Aluminum	not detected in any of the samples.				
Titanium	not detected in any of the samples.				
Zinc (Diff)	1.9	1.4	1.8	1.8	1.7

Number	E. 25 (1, 2, 3)	E. 25 (4, 5, 6)
Copper	87.2%	87.5%
Lead	trace	trace
Tin	10.3	10.2
Iron	very small amount	very small amount
Zinc by difference	2.5	2.3

The specific gravities of various bars were determined to be as follows:

TABLE OF DENSITIES.

Mark		Unstressed portion.	Stressed portion.
C. 28	Sand cast	8.463	8.548
C. 28	Sand cast	...	8.476
C. 12	Sand cast	8.548	8.536
A. 11	Sand cast	8.455	8.584
D. 14	Sand cast	8.478	8.444
E. 25	Chill cast	8.728	...
E. 25	Chill cast	8.715	8.663
Average	Sand cast	8.486	8.518
Average	Chill cast	8.721	8.663

The physical properties shown in the tables on the next page were determined on an Olsen testing machine. Each number from 1 to 20 inclusive represents the average results of the tests of three sand cast specimens, each set from one foundry, the numbers from 21 to 25 inclusive each represent the average results of sets of six chill bar specimens.

Numbers 26 to 28 inclusive represent the average results of 9 sand cast specimens of the virgin melt. No. 29 represents the average of three chill cast specimens of the virgin melt.

All of the sand cast specimens as received were turned down one thirty-second of an inch with the exception of specimens marked Nos. 5, 10, 15, and 20, so as to secure uniformity of comparison and to avoid the skin effect which would artificially increase the tensile strength of the specimen. It is unfortunate there was no uniformity of size observed in the sand cast specimens submitted, although not so stated in the specifications each cast piece was supposed to be 4½" long and ⅝" diameter center section. The expectation was to make each bar of a uniform diameter of 0.505 inch in the reduced section of the piece. The specimens numbered 5, 10, 15 and 20 were cast 14 inches long with a center section of ¾ inch in diameter, and the test pieces in these cases were cut from the center of each piece and turned down to a net section approximately of ½ inch diameter. All of the chill bars except No. 24 which were rectangular in section were turned down to approximately ½ inch diameter in the center section.

SUMMARY AND CONCLUSIONS.

1. It is interesting to note the difference in density of sand cast and chill cast metal; the latter averaging 8.69 and the former 8.50. The stressed and unstressed metal show uncertain differences.

2. The chemical analyses show that the ingots must have been of very uniform composition, and agreeing closely with the desired 88 Cu—10 Sn—2 Zn; also the remelting by the five foundries did not materially change this composition in any case.

3. As shown in the table of physical tests, the results of the tensile tests are also very uniform, both for the several foundries and for the different methods of casting.

The average of the virgin melt: tensile test was 39,200 lbs./sq. in. ± 1,960 lbs.; elongation on two inches was 13% ± 2.3%; reduction of area was 10% ± 3%. The average of the chill bars was: tensile strength 44,100 lbs./sq. in ± 2,900 lbs.; the elongation on two inches was 28% ± 3%; the reduction of area was 23.7% ± 1.3%.

The average of all sand-cast specimens of the remelted metal was: tensile strength in pounds per square inch was 35,300 lbs. ± 3,500; the elongation on 2 inches was 10.5% ± 2.6%; and the reduction of area was 9.1% ± 2.8%. The average of the chill bars of the remelted metal was: tensile strength 44,300 lbs./sq. in. ± 2,900 lbs.; elongation on 2 inches 24.6% ± 7.4%; and reduction of area 19.8% ± 7.4%.

The composite set made up of the second remelted stock, i. e., the remelting of the first remelted metal showed for the sand cast specimens an average of 37,900 lbs./sq. in. ± 2,600 lbs.; an elongation on 2 inches of 10.5% ± 2.2%; a reduction of area of 11.5% ± 3.2%. Of the chill cast the average tensile strength was 31,600 lbs./sq. in. ± 3,600 lbs.; elongation on 2 inches of 4% ± 0.7%; and a reduction of area of 6% ± 1.9%.

The virgin melt appears to give the highest tensile results. Of the castings made from remelted ingots, the tensile results are best for the metal poured in the chill mold and next for the metal poured flat in either green or dry sand. The metal poured in vertical molds shows greater variations in tensile strength and lower average values. The tests on the composite set—second remelt—especially for the chill-cast specimens, show a marked deterioration in all physical properties.

A micro-examination made by Mr. Rawdon of one specimen of the virgin metal and four specimens of the second remelted ingot, all chill cast, showed no evidence of oxide films in any of the specimens, but the "bronzite" or eutectoid is in isolated particles in the virgin specimen and does not break up the continuity of the dendritic matrix, but in the four specimens of the second remelt, the "bronzite" occurs in continuous films and completely breaks up the continuity of the matrix of the alloy, and its excess may be due to the result of more drastic chilling.

4. The ductility determinations are of less certainty than the tensile due to so many samples breaking outside the gauge limits.

5. These tests show that for sand cast specimens a tensile strength of 33,000 lbs./sq. in. could be fairly specified with an elongation of 10% and reduction of area 9%; while for chill cast specimens 40,000 tensile, 22% elongation, and 18% reduction of area can easily be met.

The author desires here to express his thanks and appreciation to Mr. R. W. Woodward for his assistance in the physical determinations of all of the specimens of this investigation, to Mr. A. B. Lort who made all of the quantitative analyses of the test bars enumerated and to Mr. H. W. Bearce for the determinations of the specific gravities.

TABLE 1.

Mark		Diam. inch	Ultimate load pounds	Tensile strength lbs./ sq. in.	Elongation on 2" %	Reduction of area %	How poured.	Remarks.
A.	1	.545	9 400	40 300	15	12	Flat, green sand.	2, B.O.G.[1] Flaw in center of specimen.
B.	2	.581	10 143	38 300	10	8.0	"	2, B.O.G.
C.	3	.473	6 445	36 600	10	11	"	1, B.O.G.
D.	4	.475	5 762	32 600	7	4	"	3, B.O.G. One broke in neck.
E.	5	.499	6 883	35 100	18	14.8	"	
Av.		.515	7 727	37 100	12	9.9	"	
A.	6	.542	7 717	33 400	10	10	Vertical, green sand,	2, flaws on one side.
B.	7	.586	10 285	38 000	15	14	"	1, flaw on one side.
C.	8	.463	6 383	38 000	10	6	"	2, B.O.G. Shrinkage draw in center, 1, oxide on side.
D.	9	.469	6 258	36 000	10	12	"	3, B.O.G.
E.	10	.501	4 645	23 600	.4.7	4.1	"	
Av.		.512	7 058	34 300	9.5	9.2	"	
A.	11	.535	8 312	36 900	8	7	Flat, dry sand.	1, flaws on side, etc., B.O.G.
C.	12	.478	6 293	35 200	11	13	"	
B.	13	.592	11 050	40 300	11	8.8	"	3, B.O.G.
D.	14	.476	6 818	38 300	13	8.0	"	3, B.O.G.
E.	15	.502	6 708	33 880	12.3	9.5	"	
Av.		.517	7 844	37 400	11.0	9.2	"	
A.	16	.537	8 822	39 000	16	13	Vertical, dry sand.	3, flaws in center and on side, B.O.G.
B.	17	.586	9 620	35 600	12	10	"	2, B.O.G. 1, flaw on one side.
C.	18	.467	3 977	23 300	4	5.0		2, full of blow holes.
D.	19	.475	6 118	34 600	9	9.0	"	3, B.O.G.
E.	20	.501	4 975	25 800	7.7	3.9	"	
Av.		.513	6 702	32 300	9.7	8.1	"	
A.	21	.500	7 618	38 900	17	16	In iron chill.	4, elliptic section. 2 flaws. B.O.G.
B.	22	.500	8 590	43 800	20	16	"	1,, B.O.G.
‡C.	23	.503	9 035	45 900	22	17.6	"	1, elliptic section.
*D.	24	rectangular	8 065	42 000	7	5	"	1, contains blow holes.
E.	25	.502	9 628	48 600	39.5	27.8	"	
Av.		.501	8 718	44 300	24.6	19.8	"	

*This specimen was irregular in cross section, broke in the threaded end so that the actual elongation could not be developed, and is not included in the general average.

[1] B.O.G.—Broke outside gauge limits.

‡C. 23 is the average of three not six specimens.

TABLE 2. COMPOSITE SET.

Equal amounts of remelts from all five foundries. 3 specimens in each sand cast set, and six in the chill cast.

Mark	No.	Diam. inch	Ultimate load pounds	Tensile strength lbs./ sq. in.	Elongation on 2" %	Reduction of area %	How poured.	Remarks.
G.F.	13, 14, 15	.502	7555	38 200	9	10.5	Flat in green sand	One B.O.G. One, flaw on one side.
G.V.	19, 20, 21	.486	6598	35 300	9	8.0	Vertical in green sand	2—flaws in center.
D.F.	16, 17, 18	.503	8547	42 900	15	18.0	Flat in dry sand	One B.O.G. One broke on gauge point.
D.V.	22, 23, 24	.502	7007	35 400	9	9.5	Vertical in dry sand	2—flaws on one end.
				CHILL CAST.				
C.	1, 2, 3, 4, 5, 6	.503	6293	31 600	4	6.0		One, flaw on one side.

The results of tests of remelted metal (Table 2) show that the specimens poured flat exceed those poured vertical in both green and dry sand both in tensile strength and in elongation. In these series the chill cast specimens are shown to be inferior to any of the sand cast specimens in all of the physical properties. The results obtained by this second remelt show that this alloy rapidly deteriorates when subjected to this remelting process.

TABLE 3. TESTS OF BARS FROM VIRGIN MELT.

Mark	Diam. inch	Ultimate load pounds	Tensile strength lbs./ sq. in	Elongation on 2" %	Reduction of area %	How poured.	Remarks.
C. 26	.463	6 383	38 000	10.0	6	Vertical, green sand	One broke outside gauge length.
C. 27	.475	7 162	41 600	16.0	14.0	Flat, dry sand	ditto
C. 28	.473	6 675	37 900	12.0	10.0	Vertical, dry sand	ditto
C. 29	.502	8 408	44 100	28.0	**23.7**	Chill cast (av. 3 tests)	One specimen showed flaw at one side.

In both Nos. 27 and 28 one specimen showed a shrinkage draw in center. No specimens poured flat in green sand were submitted.

CONSIDERATION OF GOOD SHOP PRACTICE IN A BRASS MANUFACTURING PLANT

SOME VALUABLE SUGGESTIONS FOR THE METAL WORKER.

WRITTEN FOR THE METAL INDUSTRY BY P. W. BLAIR, Brass Finishing Superintendent.

The up-to-date foremen or department heads in a brass manufacturing plant should always be mentally alert and quick to see an opportunity wherein their own and the firm's interest can be advanced. Because work has been performed in a certain way or manner for a long period of time, there is no reason why it should be accomplished in the same identical way indefinitely.

While in the majority of cases present methods of doing certain operations might not very well be improved upon, there are many instances where a little thought logically applied would greatly increase the productiveness of a man or machine, often eliminating much labor, otherwise uselessly expended. A foreman's loyalty to the firm may be shown in the implicit manner in which he follows the directions of the concern and yet he may be quite indifferent to efficiency possibilities that would seem very clear to a more receptive mind or observant eye.

When a foreman concentrates his thought upon a piece of work and interests the men under him, something is bound to develop. When men are enthusiastic about a certain piece of work, their minds are alert, they are productive, prolific in ideas and original and when the question is put up to them to adopt another method of production on a piece of goods and use their own creative judgment, how quick the man will adopt same, when he sees your outline or idea.

Another method that all foremen or department heads in a brass manufacturing plant should adopt is to keep a private note book for to take notes of their work or even the work going on around the plant. I have even known foremen platers who are keen at their craft and in many cases who have acquired a sound technical education, depend entirely on their memory.

A good memory is valuable to the foundry foreman and all department heads, but that is no reason why the mind should be burdened by details that could be actually stored in a note-book.

As an illustration in class work the students are impressed with taking notes and it seems even more important that notes should be taken on practical shop work. When the men see the foreman taking notes on a class of goods in the course of manufacture for the first time it sets him thinking and he will adopt the same method so that he can study the matter up and when the same class of goods come again at a later date he can consult his note-book which gives him the desired information and any suggestion he sees fit to adopt he can give a trial.

It need not be a laborious task, nor need it occupy much time, but should be done when the occasion arises. A small pocket note-book into which can be jotted the many little things that occur each day and checked up every month will show wonderful results. The foreman pattern maker can adopt this method of taking notes to good advantage, as some firms nowadays get quotations from outside concerns that make a specialty of patternmaking. The foreman is then in a position to refer to the notes he has made and the time consumed in the past on similar jobs.

Few foremen in a brass manufacturing plant have the opportunity of studying the development of other concerns and have to develop a creative mind to keep up with the progress being made all along the different lines. The cultivation of different ideas among the men stimulates their thoughts and results are sure to follow. By cultivating the creative thought is to study the other fellow, not with the purpose of adopting his ideas, but to see wherein his particular principle may fit in with your own line of work and become conversant with up-to-date equipment.

PHOSPHORUS FOR DEFENSE.

The New York Times of February 22 published a news item describing a device recently constructed for use on ships as a means of submarine defense. The apparatus consists of a drum filled with phosphorus. At the proper moment the phosphorus is ignited and the vessel is immediately enveloped in a cloud of BLACK smoke, thus making it difficult for the attacking submarine to direct its torpedo. This is very interesting news in that it shows up the valuable metalloid phosphorus in a new light. Phosphorus, as is well known, plays a very important part in the arts, being not only a very valuable component of fertilizers for growing crops of all kinds, but also is used in large quantities for the production of matches. It is used in no inconsiderable quantities in the metal trades as a deoxidizing agent. In the form of phosphor copper and tin, it makes possible high grade bronzes which give us rod and wire of great strength and non-corroding qualities. and taking it all in all is a material that we can ill spare for the operations of war where it would be used in such lavish quantities as the item in the Times indicates.

One little word in the item in question gives rise to the hope that while phosphorus MAY BE USED it is in combination with something else and that the phosphorus is in the minority and is only the igniter. That word is BLACK, for phosphorus by itself gives off a dense WHITE smoke. Phosphorus combines with oxygen to make five different oxides and its combustion or oxidation is complete with the formation of phosphorus pentoxide (P_2O_5), which is a white compound. If the smoke given off by the submarine baffler device is black we must assume that some carbon compound is mixed with the phosphorus, probably some oil. In this case only a small amount of phosphorus would be needed and we hope this is so in order that the phosphorus supply may be conserved.

TO FIND THE WEIGHT OF A CASTING FROM THAT OF THE PATTERN.

A pattern weighing one pound will weigh when cast in

	Cast iron.	Yellow brass.	Gun metal.	Zinc.	Copper.	Aluminum.
Bay wood	8.8	9.9	10.3	8.8	10.5	3.2
Cedar	16.1	18.	18.9	15.6	19.2	5.8
Cherry	10.7	12.	12.6	10.4	12.8	3.9
Mahogany ...	8.5	9.5	10.	8.2	10.1	3.1
Maple	9.2	10.3	10.8	8.9	11.	3.2
Oak	9.4	10.5	11.	9.1	11.2	3.4
Pine, white ..	14.7	16.5	17.3	14.3	17.5	5.3
Pine yellow ..	13.1	14.7	15.4	12.7	15.6	4.7
Whitewood ..	16.4	18.4	19.3	15.9	19.5	5.9

Allowance must be made for the metal in the pattern.

EDITORIAL

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THE METAL INDUSTRY

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THE WAR AND METALS

The metal industry whether represented by the largest brass corporation or by the smallest foundry or metal shop has been for the past month on the anxious seat in relation to conditions concerning War. The general outlook for the past month has been that we were slowly and surely drifting toward the maelstrom of disaster, that has so completely enveloped unhappy Europe for the past two and a half years. General business has on the face been good but there has been apparent for the past month, a feeling of unrest particularly in metal circles. This has been most clearly reflected in the up and down trend of metal prices.

We had hoped that before the end of last month something definite would have happened to relieve the strained condition and terminate the suspense. The administration at Washington seemed to be waiting for the commission of what was termed the "Overt Act." This "act" occurred February 25 when the steamer Laconia was sunk without warning and two AMERICAN WOMEN lost their lives. Congress was asked by the President for full power to deal with the situation as he deemed best. The immediate measures proposed being to arm merchant vessels leaving this port. Congress delayed action until on March 1st the world was electrified by hearing that Germany had plotted to ally with herself Mexico and Japan against the United States. This news being authenticated spurred the House of Representatives to pass a modified bill. The Senate, however, due to the traitorous and unbelievable course adopted by a handful of pro-German and pacifist Senators willing to betray their country by subordinating American rights to the German dictates, adjourned without passing the bill!

There is some light still shining through the darkness that envelops international affairs, however, and this is that the measures needed for the immediate improvement of our navy have been authorized by Congress. The money essential to carry out the plans, some $535,000,000 will be available at once and the Navy Department has power to commandeer any shipyard to give Government work precedence. As will be seen in reading the letters published in our TRADE NEWS Columns the effect of the submarine campaign is already being felt among our metal works. The situation in Waterbury and other brass-center cities is becoming serious, due to non-ability to ship their products. Help is being laid off and factories are being closed down, so it is very important that something should be done and done soon, so that AMERICAN products and AMERICAN people can sail the seas in safety.

METAL NOMENCLATURE

Two papers prepared by Messrs. Burgess and Karr respectively of the United States Bureau of Standards on the subject of the nomenclature of the metals were presented at the Chicago meeting of the American Institute of Metals in September, 1913.* A spirited discussion followed the reading of the papers and it was finally voted that the matter be referred to the executive committee to confer with the Bureau of Standards and report at next year's meeting with some sort of suggestion as to what should be done to free the metal industry of some existing misnomers and improper designations of metallic alloys. Two years have gone by and nothing as far as we know has been done. Is the matter moribund or are the members of the committee loath to tackle a subject that is so full of perplexities and whose suggested settlement is bound to be beset with difficulty?

Might we suggest to the committee and to the Bureau of Standards that the coming meeting of the Institute at Boston next September will, we believe, be an opportune time to make some kind of report if only a beginning is made. For instance, the subject of German silver may be taken up. The time is coming, we believe, when a change will have to be made in the name of this important ternary alloy. The signs of the times point to even graver results than the severing of diplomatic relations with Germany and if, as seems now inevitable, war results, we shall be forced as was Great Britain to re-name the alloy. As a cold matter of fact the alloy as we know it never had the right to the name Neusilber (German silver) anyway. The useful combination of copper, nickel and zinc was first discovered in China in the seventeenth century under the name of Packfong, or white copper and was so brought to England. Eventually Germany produced the alloy under the name as given above, Neusilber, and it was finally introduced into France as Maillechort and into England as German silver, so Germany will be losing nothing if the name is now changed.

England has, as said before, already changed the name to "nickel silver," but we fail to see that this is much better than the former one. The mixture contains no silver although the alloy as a whole does possess to a slight extent some of the properties of that metal, such as color and some of its mechanical characteristics. One strong point against the adoption of this name is the fact that it can be and probably is being used (though perhaps unintentionally) by manufacturers of flatware to deceive the confiding public. As a concrete example of what we mean we present the following: We listened to a conversation between a salesman and a purchaser regarding a piece of plated ware. The lady closely examined the article and discovered that it bore an inscription on the bottom "Quadruple plate on nickel silver." "What does this mean," she said, reading it over. "That means, Madame," said the clerk "A heavy coat of silver on a nickel silver base metal." "Oh! I see, and what is nickel silver?" she asked. "Well," said the clerk, "Nickel silver is what they now call German silver 'count of the war." "Oh yes, I know," said the buyer, "but it still is made of silver is it not?" "YES, MADAME, I BELIEVE SO!" said the clerk. Now maybe he did believe so. If he did it was his business to know just what German silver or nickel silver was so that he could explain to the customer and not allow any such wrong impressions to be carried out of the store. If we had a self-explanatory name for this alloy and others of like nature there would be no opportunity for such episodes as the above.

In a conversation with a dealer in silver ware whose stock included just such marked pieces the name "nickel brass" was suggested. The dealer objected strongly to this as he said it had a cheap sound and thought it would cause a prejudice in the mind of the buyer. Perhaps this is so, but as a matter of metallurgical classification nickel brass is just what the alloy really is, for the amounts of copper and zinc found in the average 18 per cent. German silver would by themselves make what is known in the metal trade as a "good high brass." So here is one of the problems which confront the committee and we would suggest as a starter that the alloy be called in accordance with the content of nickel as for instance 5, 10, 15, 18, 20, etc., per cent. NICKEL, just as gold alloys are called 10, 12, 14, 16, 18, 20, etc., KARAT GOLD as indicative of the amount of gold they contain without reference to the rest of the alloy. It seems to us that it would sound much better to say 18 per cent. NICKEL than to say 18 per cent. NICKEL BRASS. The other alternative is to name the alloy strictly in accordance with the metallic content and then educate the public to what it means.

*Transactions, Vol. VII, 1913.

VALUE OF A REFERENCE LIBRARY

One of the first things a man does, or should do, when he starts in business, or plans to start a new department in an already established business, is to gather together all the available information concerning that business that will give him the best idea of the state of the art. By far the greater part of such information that is good for anything will be found in trade journals and books that cover the field in question. When a man has spent a number of years working on any one subject he, if he is human and has the interests of his fellow men at heart, will write either an article or a book on the subject. In these writings he will set forth the obstacles met and overcome, the results of experiments and what methods he applied to solve the many problems involved. He may not succeed in writing a wonderful story nor tell it in wonderful language but he has done what he could to add to the general knowledge of his chosen subject and he is given due credit.

Books and trade journals may be taken as rungs of a ladder up which one may climb on his way to the top of industrial success. We do not mean to convey the impression that all one has to do to become successful in business is to read magazines and books. Far from it, these things are merely aids to the solution of problems that may come up in the course of business. Some books are merely recitals of what has been done in certain lines, stories as it were, told to instruct the reader as to the conditions he may expect to encounter if he tries to do a certain thing. Some books are authoritative, written by masters in their line, and a study of such as these will very often save hours of time and thousands of dollars for they point out the proper course to follow in some particular line of endeavor. There are books, however, which fall short of their purpose and aside from being histories are worthy of but little attention. It is these considerations that make the selection of a reference library most important and this matter should be referred to the judgment of those who have made a study of the subject.

THE METAL INDUSTRY DIRECTORY AND BUYERS' GUIDE FOR 1917 is now in press and will be issued within ten days. This issue as well as those preceding it has been given careful attention by our staff. In it as formerly will be found a judicial selection of what have been decided to be the best books published on the various subjects relating to the metal industry. These subjects are classified according to the operations met with in the production of manufactured metal goods. The divisions are METALLURGICAL, which covers the work done in smeltery, refinery, foundry, casting shop and laboratory. MECHANICAL, which includes all the operations of the machine shop, press and stamping rooms and their tools. PLATING AND POLISHING, which covers all the operations involved in the finishing of metals. Under these headings will be found a brief description of the best books published on the various subjects. These books number forty odd titles and so well did one concern think of the selection that they ordered the whole lot at one time!

In discussing books and their value in a reference library we must not lose sight of the fact that articles in trade journals, either short or serial, play their part in industrial literature. THE METAL INDUSTRY has, by virtue of the publication of articles on every possible subject relating to the metal industry, become a most valuable adjunct to a reference library and therefore no selection for such a library is complete that does not include the bound volumes. The new DIRECTORY gives a complete list of the principal articles that have been published in THE METAL INDUSTRY for the past six years all listed under the same headings as in the books. This makes it very easy for one to see what the bound volumes contain and determine in advance what benefits can be derived from their ownership.

The DIRECTORY concludes with an alphabetical index of the products of THE METAL INDUSTRY advertisers which is very complete and covers the whole field of apparatus and supplies used in the metal industries. This makes the DIRECTORY a remarkable little book of "three-in-one" value which we want every one in the metal business to profit by. Send for your copy. It's FREE!

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

CYANIDE SHORTAGE

TO THE EDITOR OF THE METAL INDUSTRY:

The reply of Mr. Wilmore to our recent reference to his article in your January issue, page 12, does not agree with the particular passage in this article to which we referred. When he reminds us that his article attacks no firm, but a general condition of the market we quote this passage of his article:

"The explanation is more properly to be sought in the surmise that a single company has control of their manufacture and is holding out for unfairly large profits."

This is part of the article we commented on as showing a lack of knowledge of the situation. Many of your readers are familiar with our selling price but for Mr. Wilmore's benefit we would state that the highest price charged by us to consumers and jobbers for bulk packing has been 30 cents per pound. We believe we can close this correspondence with this information.

THE ROESSLER & HASSLACHER CHEMICAL COMPANY,
W. A. HAMANN,
New York, February 14, 1917. Treasurer.

KLEANRITE

TO THE EDITOR OF THE METAL INDUSTRY:

I am informed by Mr. R. J. Watters, general manager of the R. J. Watters Company, Inc., Buffalo, N. Y., that my statement concerning "Kleanrite" in the article entitled Mechanical Plating in the February number of THE METAL INDUSTRY is incorrect. Mr. Watters states that "Kleanrite" is a product manufactured by them by a secret process. I am very glad to make this correction.

D. W. ROBINSON.
Ilion, N. Y., February 28, 1917.

NEW BOOKS

Export Trade Directory. B. Olney Hough, editor of the American Exporter. 6½ x 9 inches. 536 pages, including index. Bound in cloth. Published by the Johnston Export Publishing Company. Price $5.00. For sale by THE METAL INDUSTRY.

This work is the fifth edition of the Export Trade Directory of export merchants, manufacturers' export agents, foreign exchange bankers, foreign freight forwarders, steamship lines, foreign consuls, etc., in principal ports of the United States for 1917-18.

The fifth edition of this directory is especially notable for the extraordinary increase in the number of houses engaged in various branches of activity connected with the export trade. The tremendous increase in American exports, the insistent demands for our goods on the part of foreign buyers, the unusual profits to be made, the complexities of shipping under war conditions and the scarcity of many supplies coupled with high prices, all have combined to tempt into this field an unprecedented number of new export merchants and especially of buying offices in this country of large foreign importers. The effort has been to make the lists included as complete as possible, down to the hour of going to press. Yet more new houses are, however, springing up from week to week.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

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ALLOYING

Q.—We are making a number of aluminum shells for grinding lenses. The casting is first turned to shape, then slightly heated so as to get the correct curves, then heated again—but find the casting warps. Can you suggest an alloy to prevent the warping?

I am using the following alloys:

(1) Hardening used; copper 22, zinc 16, tin 28 (3½ to 20 pure aluminum over 99%).

(2) Hardening used; yellow brass punchings 30, aluminum 8 (4 to 16 pure aluminum).

A.—Your alloys calculated to a percentage basis will have the following composition:

	No. 1	No. 2
Aluminum	85.10	84.21
Copper	4.98	10.26
Zinc	3.62	5.53
Tin	6.30	

The most essential thing in the case of a casting of the character described, will be to have the pattern made, if possible, so as to give a uniform cross-section. Next it should be so gated that it may shrink freely when cooling from the molten state. Pouring at a low temperature and the use of an alloy of low shrinkage would also be advantageous.

An alloy of 93 aluminum and copper 7 is recommended for making the aluminum shells wanted. It casts with great uniformity and has a rather low shrinkage. The aluminum zinc alloys are less uniform and frequently crack.

The melting of the alloy under powdered graphite and casting it into ingots is suggested, the melting being done at a high temperature. The inots can then be remelted and poured at a low temperature. Annealing the castings at 500° C. should relieve casting strains and prevent warping.

If it is important to study the warping of the castings, or any polymorphic changes that may occur during aging, the use of the Crandall micro-micrometer is suggested. This instrument measures a minimum count of 0.00004 inch and is used in connection with Wedelstaedt tubes.—J. L. J. Problem 2,411.

ANNEALING

Q.—We are drawing sheet nickel into small cups. Can you tell us the best method of annealing this material? It is our desire to get this material as soft as possible. The cups measure all the way from 1 to 1¼ inches in diameter and from 1 to 2 inches deep.

A.—The nickel cups may be annealed by placing them in iron pans and heating in a closed muffle furnace that may be fired by coal, wood, gas or oil. The temperature is raised gradually until what is known as a cherry red is obtained, and this means about 1,600 degrees Fahr. Care should be taken to keep the temperature uniform and not subject the cups to the sudden changes of temperature while in the furnace.

A good method to follow would be to pack the cups in powdered charcoal in iron boxes, which may be sealed by means of luting with fire clay. This annealing in the boxes will enable the cups to be taken out afterwards in a clean and bright condition, so that it will not be necessary to pickle. If, however, the closed box method is not pursued then the cups may be pickled, but it must be remembered that the chromic acid mixture not only dissolves the oxide, but also attacks the metal itself. Some persons, however, would rather pickle than go to the trouble of using the box method, in which case the cups may be allowed to cool slowly in the air and then can be pickled in a solution of sulphuric acid and water in the proportions of eight parts of water to 1 part of the acid, taking care to pour the acid into the water when mixing the mixture and adding a quart of nitric acid (30°) to every 150 gallons of sulphuric acid solution made up. A pound of bichromate of potash is then added to the solution and the cups may be put in brass or copper perforated trays or baskets and immersed in the solution for from 5 to 10 minutes.—K. Problem 2,412.

COATING

Q.—We desire to know the difference in weight of coating metals of the following mixtures used on 20 gauge black sheet steel hoops:

Pure zinc.
Pure tin.
Terne metal of 30% tin and 70% lead.

The point is, we wish to ascertain what amount of coating metal in the given surface of this steel it will take in using the three different coats.

A.—The weight of any coating will depend very much on the manner in which the process is executed. In commercial tinning, galvanizing, etc., every effort is usually made to obtain a very thin coating. In the case of sheet metal, this is generally accomplished by passing through wipers or rolls.

The following is the weight of coatings that would be obtained by simple dipping without any resort to such appliances as rolls:

Pure zinc	1.70 oz. per sq. ft.
Pure tin	.10 " " " "
Terne metal of 30% tin and 70% lead	.17 " " " "

These figures are approximate values. Where exact figures are required a large number of samples should be taken, accurately measured and weighed, the coating removed and the difference ascertained by weighing the uncoated sheets. In removing the coating, a little iron is dissolved from the sheet and due allowance must be made for this loss in the calculation of the results.—J. L. J. Problem 2,413.

ETCHING

Q.—We would like to know how we can etch on pewter.

A.—Pewter cannot be etched by ordinary acids on account of its high lead content, so electrolytic etching will have to be used. The following method will probably answer your purpose: Prepare a solution consisting of 1 part of hydrofluoric acid and 3 parts of water or 1 quart of hydrofluoric acid and 3 quarts of water. Arrange the solution in a lead lined wooden tank or a tank coated with asphaltum. A stoneware tank will not hold hydrofluoric acid solutions. Arrange with connections in plating, but the polarity must be reversed, that is, the pewter, articles to be etched must be made the anode and the negative connections pieces of carbon. Use a voltage of 3 to 4 and place the pewter in the solution. The pewter articles should be protected with a stop-off varnish where they are not to be etched. Run a fairly strong current upon the articles and the etching should be completed in a few minutes, but it will depend upon the depth of the etching required.—C. H. P. Problem 2,414.

FINISHING

Q.—Do you know of any dip that will pit britannia metal to give it a frosted or sand blast effect?

A.—There is no acid or alkaline method that will pit britannia

metal to give it a frosted or sand blast effect. The satin finish is the simplest method to produce and can be accomplished by using a swing scratch brush. These brushes can be procured from dealers in platers' supplies.

The brushes are made up from a number of thin steel wires about 22 B & S gauge. The wire is cut about five inches long and bent in two similar to a hair pin, but a little closer together. The wires are then secured to a small steel screw eye in bunches of twenty, thus making forty ends and then the wires are bound close to the screw eye by a thin soft copper or soft annealed steel wire and finally soldered with soft solder to hold them firmly in position. About four of these swing wires are placed equal distances apart in a small hub made from hard wood or a worn out scratch brush hub will answer the purpose. Run the swing brush about 600 revolutions per minute and hold the work against the brush without any pressure so that the ends of the wire, as they swing around, will pit the brittania metal.—C. H. P. Problem 2,415.

GILDING

Q.—I have had occasion to gold plate a number of die castings, but find that a great many of them blistered. Could you give me a formula to avoid this trouble?

A.—To overcome the difficulty of blistering on die castings, which are to be gilded, it is advisable to use a preliminary nickel strike or light plate. After the slight nickeling the die castings should be coated over in a brass solution for a few moments, and then gilded in the regular manner. For a nickel solution use the following:

Water	1 gallon
Single nickel salts	12 ounces
Magnesium sulphate (epsom salts)	4 to 6 ounces
Ammonium chloride	2 ounces

For the brass solution:

Water	1 gallon
Copper cyanide	3 ounces
Zinc cyanide	1 ounce
Cyanide mixture (98%)	5¾ ounces
Ammonium chloride	⅓ ounce
Soda ash 50%	1 ounce

For the gold solution:

Water	1 gallon
Gold trisalyt	½ ounce
Cyanide (98%)	1 pennyweight
Phosphate soda	¼ ounce

—C. H. P. Problem 2,416.

MELTING

A.—Is there any way of stopping zinc from cracking after it has been cast on iron shafts in cast iron molds? These rolls are cast on 2⅝-inch diameter shafts, 8 inches diameter and 24 inches long finished. They are cast on end and poured from top of mold with allowance for shrink head. We have two troubles with these rolls, one is from cracks and the other is flaked spots after finishing, caused by pouring the metal at too low a temperature. If poured at a higher temperature, they crack. These cracks run around the roll in most cases but may be lengthwise and at times do not show up until a cut is taken off. This trouble does not happen at all times but has been going on for some years, and it is a case of making them until we get good ones. We use Horse-head zinc. These rolls are used in the manufacture of powder and have to be perfect.

A.—Horse-head zinc, due perhaps to its freedom from cadmium, gives a very strong, tough casting and for this reason is a favorite brand with makers of articles that are liable to crack. The regular brass-melter's crucibles should be used for melting, as zinc melted in iron pots readily takes up iron and is thus rendered sluggish. Very small amounts of aluminum have been recommended to make zinc more fluid and less liable to crack but its action seems to be more or less uncertain.

You will obtain the best results by using the purest Horse-head or electrolytic zinc, melting in graphite crucibles and carefully fluxing the metal. It should be poured at as low a temperature as possible and the shafts strongly heated. It is suggested that the shafts be galvanized before casting and that they be left in the galvanizing kettle until at the temperature of the molten zinc, then quickly removed, placed in the iron molds and poured.

To prevent the flaking, rapid pouring and the avoiding of splashing is necessary. It might even be desirable to use a basin so that the pouring may be done very rapidly and at a very low temperature.—J. L. J. Problem 2,417.

PLATING

Q.—How can glue be taken out of an acid copper solution without spoiling the working qualities of the solution?

A.—Glue will be found a very difficult material to remove from an acid copper solution. Acetic acid would probably produce a fermentation and bring the glue to the surface but then the solution would be of no practical value. Boiling the solution, replacing the evaporation with water, and adding a small amount of sulphuric acid say about ¼ to ½ ounce per gallon will help considerably. After boiling and cooling the solution the glue would no doubt come to the surface and could be skimmed off.—C. H. P. Problem 2,418.

POLISHING

Q.—What are the most essential revolutions per minute for buffs and brushes on different metal finishes, and also what should be the speed of an eight-inch tampico wheel for brush brass?

A.—The speed of polishing wheels is largely determined by the diameter of the wheel. For cutting down purposes a 12-inch wheel should run at 2,500 revolutions per minute; coloring buff wheels 8 to 12 inches, 3,000 revolutions per minute; emery wheels from 1,500 to 2,500 revolutions per minute. Tampico brushes for brush brass work should be 8 inches in diameter and should be run at about 250 to 400 revolutions per minute.

The above, of course, are only approximate speeds and the most suitable speed to use for the different brushes and buffs are determined by experiment, but in all instances where cloth buffs are used the speed must be sufficient to produce a rigid wheel to obtain the best results.—C. H. P. Problem 2,419.

STAMPING

Q.—We are manufacturing fobs, novelties, key tags and articles of that nature out of cold rolled steel. We have more difficulty striking out cold rolled steel than we do brass, the steel seeming harder and tougher than brass. Can we obtain cold rolled steel that would be as soft or nearly as soft as high brass? Also, tell us how to quickly remove the scale from cold rolled articles after they have been struck and annealed.

A.—You are correct in thinking that sheet steel is harder than sheet brass. Brass has a scleroscope hardness of 10 to 15 while mild steel of .15 per cent. carbon has a hardness of 22 or nearly twice as great. Sheet steel is much stiffer than sheet brass, its elastic limit being twice as great. Wrought iron has a much lower elastic limit than steel and it is much softer, but even it is not as soft as sheet brass.

Annealing will soften steel but excessive annealing gives a loose coarse structure that does not press well.

A fibrous structure is sometimes to be seen on high grade sheet iron and steel strip but it disappears on repeated cold rolling and annealing.

You will find the Erichson Machine for Testing Metal Sheets a valuable aid in determining the drawing, stamping and folding quality of sheets of 0.1 to 5.0 millimeters in thickness.

Instead of having to remove the scale from cold rolled articles that have been struck and annealed, it is better to prevent the formation of scale by the process known as gas pickling or bright annealing. Where the annealing has been done in the air and scale has formed on the work, pickling in hydrochloric acid will remove it. Thorough washing should follow and finally immersion in lime water to remove any traces of acid.—J. L. J. Problem 2,420.

PATENTS

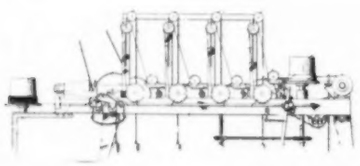
A REVIEW OF CURRENT PATENTS OF INTEREST

1,211,715. January 9, 1917. **Method of Welding a Protective Covering of Copper to an Iron or Steel Body.** J. Kirby, Pittsburgh, Pa.

This invention relates to a method of welding a protective covering of copper to an iron or steel body, and has for its object to provide a method, in a manner as shown in cut, whereby copper sheets, plates, cylinders, sleeves, jackets, etc., can be welded to the exposed surface or surfaces of an iron or steel body so as to prevent such surface or surfaces from corroding or rusting from atmospheric action, which otherwise would be the case when the exposed surface or surfaces is or are subjected to the action of the atmosphere.

Briefly described the method consists in the setting up of a copper covering, such as a copper plate, sheet, cylinder, etc., within a mold and then running or pouring into the mold against the inner face of the covering molten iron or steel, at as low a temperature as is consistent with a fluid state. The heat of the metal will attack the inner face of the covering sufficiently to soften said inner face and the copper in such condition will readily unite with the iron or steel during the solidification of the latter and have all the characteristics and withstand all the usual tests of a true weld.

1,212,919. January 16, 1907. **Continuous Wire-Drawing Machinery.** James P. Dooley, of Worcester, Mass., assignor to Wright Wire Company, of Worcester, Mass., a corporation of Massachusetts.



This invention relates to an improvement in that class of wire-drawing machinery in which the wire to be drawn is reduced in diameter a number of times by being successively passed through a series of dies in one continuous drawing process.

The present invention contemplates, in a continuous wire-drawing machine, as shown in cut, the elimination of all speed changing means of the character above referred to for the drawing or forwarding drums, and the provision of a series of positively driven drawing drums, having predetermined peripheral speeds, said speed so calculated as to reduce to a minimum the possibility of slippage between the drum and the wire that is being worked.

It is also proposed, in a machine of such character, to so proportion the successive dies of the machine that the final die through which the wire is drawn merely shapes and smoothes the same, whereby the necessity for a heavy draft on the wire in its finally reduced state is avoided.

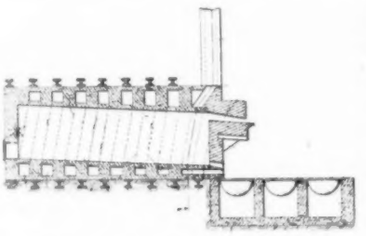
1,214,271. January 30, 1917. **Process of Plating.** Lucian W. Bugbee, of Southbridge, Mass., assignor to American Optical Company, of Southbridge, Mass., a voluntary association of Massachusetts.

This invention relates to an improved process of plating metallic articles, and has particular reference to the plating of aluminum by electro-deposition or otherwise.

Briefly stated, the process consists in the immersion of the article to be plated in the plating bath or solution, and at the outset subjecting the article to a simultaneous abrading and plating action, which abrading action shall initially be as great or greater than the plating action, whereby the surface to be plated is thoroughly abraded, freed from hydrogen or other bubbles, and a chemically clean surface which will receive a plate secured, subsequent to which the abrading action is decreased or the plating action increased until the plating action becomes equal to and subsequently greater than the abrading action, and ultimately ceasing the abrading action after the article has been thoroughly covered with a film or plate to eliminate abrasion of the plate, while continuing the plating action till the desired thickness of plate has been obtained.

1,213,922. January 30, 1917. **Zinc Furnace.** George Londress and Leyland Rogers, of Clarksburg, W. Va.

The present invention consists of improvements in zinc dross refining furnaces. An object of the invention is the provision of a zinc dross refining furnace, shown in cut, which is designed to be constructed from firebrick or other similar material, so braced and reinforced as to prevent any disintegration of the same, therefore insuring the long life thereof.



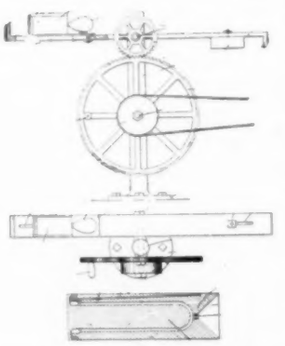
Another object of the invention is the provision of a furnace such as described having a plurality of fire boxes and a spiral flue in communication therewith.

A further object of the invention is the provision of a zinc dross refining furnace having a fire box and chamber into which dross is placed to be refined.

Still another object of the invention is the provision of a zinc dross furnace having a series of fire boxes over which is a chamber for receiving the dross to be refined, the said fire boxes having a spiral flue surrounding the same, the said dross chamber having an opening therein through which refined zinc can be discharged and a second opening extending above the first opening from the dross chamber into a condenser for permitting vapors or oxide arising from the dross to pass into the condenser for condensation.

1,215,243. February 6, 1917. **Apparatus for and Process of Die Casting Pure Aluminum, Its Alloys and Other Lighter Metals.** F. H. Borsh, of Artesian, S. D.

The present invention appertains to an apparatus for and process of die casting aluminum and other lighter metals or materials.



One of the objects of the invention is the provision of a novel and improved method for casting aluminum, as shown in cut, and equivalent materials in a thoroughly practical and efficient manner.

Another object of the invention is the provision of an apparatus of novel and improved construction to carry out the process.

Heretofore, it has been difficult if not impossible to cast small articles of aluminum and other lighter metals, due to the fact that the aluminum when poured in a molten state into a mold is not sufficiently heavy to fill the cavities of the mold, thus producing voids and resulting in an imperfect and incomplete casting. Various methods have been attempted with little or no success, whereas the present invention provides ef-

ficient and simple means whereby small articles can be cast from aluminum in a perfect and reliable manner.

The salient features of the invention are the advantage taken of centrifugal force for delivering the molten aluminum into the cavities of the die or mold, and the discharge of the air from the outer end of the mold in a direction opposite to the flow of metal into the mold, and it is these two features combined which render the apparatus and process feasible and effective.

1,214,539. February 6, 1917. **Method of Improving the Alloying Qualities of Manganese with Brass and Bronze.** Hans Goldschmidt and Otto Weil, of Essen-on-the-Ruhr, Germany, assignors to Goldschmidt Thermit Company, of New York, N. Y., a corporation of New Jersey.

The employment in a brass or bronze bath of a manganese-copper-phosphorus alloy, or a ferro manganese-copper-phosphorus alloy shows important advantages compared with the separated use of manganese, or manganese-copper and phosphor-copper. The introduction of the manganese into the metal baths takes place very easily without any excess heating. The phosphorus is a strong deoxidizing reagent, and its products of oxidation being gaseous at the temperature of the metal bath, cause a good mixing together of the metal bath by their escape. The mode of employment is carried out like that of phosphor-copper. Another advantage obtained by the employment of the ternary or quaternary alloy consists in a single addition and in a single weighing. In the same manner manganese can easily be introduced into nickel alloys.

The patent covers: The method of producing a brass or bronze containing manganese, which consists in first improving the alloying quality of the manganese by alloying ferro-manganese with phosphorus and copper, and then adding the pre-alloy thus formed to the metal bath containing the other ingredients of the alloy.

1,215,463. February 3, 1917. **Process for Rust-Proofing Metal.** William H. Allen, of Detroit, Mich., assignor to Parker Rust-Proof Company of America, of Detroit, Mich., a corporation of Michigan.

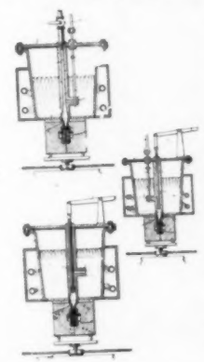
This invention relates to the process of so acting upon the surfaces of articles of iron and steel as to render them rust-proof, that is, to so change the character of such surfaces that they will be substantially unaffected upon exposure to moist air. This invention is carried out by changing such surfaces into insoluble basic phosphate of iron by immersing the articles in a proper bath.

The patent covers:

1. The process of rendering articles of iron and steel rust-proof, which consists in immersing the same in a solution of ferric acid phosphate.

2. The process of rendering articles of iron and steel rust-proof, which consists in immersing the same in a substantially boiling bath of water containing about eight-tenths per cent. of ferric acid phosphate.

1,214,904. February 6, 1917. **Art of and Apparatus for Casting Fluid Metals.** Herman H. Doehler, of Brooklyn, N. Y., assignor to Doehler Die Casting Company, of Brooklyn, N. Y., a corporation of New York.

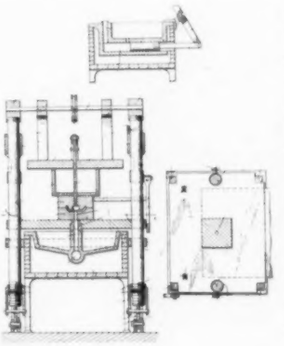


The essentials of the invention are the control of the volume of the molten metal to be delivered to the die; the timely measurement and separation of the desired volume from the melting-pot and its maintenance at the desired temperature to insure the requisite fluidity thereof; the interposition of a solid mass of the metal between the means forcing it into the die and the die while it is confined in a constricted passageway, and the application of pressure to the fluid metal while in the constricted passageway, and while it is flowing by gravity into the mold.

The invention consists primarily in the art or method of casting fluid metals consisting in maintaining a mass of molten metal about a chamber, shown in cut, having a downwardly opening discharge port in the bottom thereof adapted to communicate with the ingate of a metal die, delivering the molten metal from said mass to said chamber from a point intermediate the top and bottom of said molten mass, and in sufficient quantity for a single casting, sealing said chamber against the ingress of molten metal when the desired quantity has been introduced thereto and applying pressure to the metal contained in said chamber while it is flowing therefrom to the die.

1,215,784. February 13, 1917. **Die-Casting Machine.** John T. Enley, Philadelphia, Pa.

This invention relates to improvements in die casting machines, the object of the invention being to provide a machine of the character stated, which will permit a quick operation, and which can be conveniently handled by a single operator.



A further object is to provide improved means for cutting out the spruce and separating the die sections so as to present the casting in a convenient position for removal from one of the die members.

A further object is to provide an apparatus of the character stated, which is of comparatively simple construction, strong and durable in use.

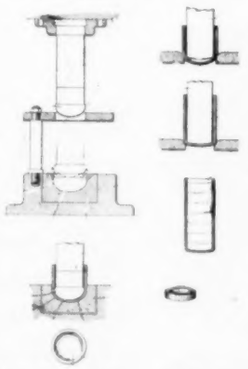
With these and other objects in view, the invention consists in certain novel features of construction and combinations, and arrangements of parts, as shown in the cut.

The patent covers:

In a die casting machine the combination with a frame, upper and lower platens normally connected and movable in the frame, mold members carried by the respective platens, and normally together, means for raising and lowering the platens, means permitting the downward movement of the lower platen after the platens are elevated, whereby the mold members are separated, said upper platen having a pivotal support, a locking lever normally holding the upper platen against pivotal movement, and means compelling the upper platen to swing when said locking lever is released.

1,216,282. February 20, 1917. **Method of Working Copper.** F. S. Carver, of Newark, N. J., and W. H. Harman, of Lansdowne, Pa.

This invention relates to an improved method of making copper tubes and rifling bands for ordnance.



The method is designed to provide such tubes and bands cut therefrom with comparatively little expense, that are solid and homogeneous throughout, and that will pass the rigorous inspection invariably given to rifling bands such as are used on projectiles to act as a seal for ordnance gases and to insure effective contact with the rifling of a piece of ordnance.

The metal, which is preferably copper, is provided in a hot state. The metal is first subjected to a combined compression and extrusion operation. Apparatus adapted for this purpose is illustrated in the cut, consisting of a substantially cup-shaped die placed in a suitable die holder and disposed in the path of a plunger, which is provided with a substantially mushroom shaped head so shaped as to present a smoothly curved working surface, and to avoid any sharp corners in its working surface. The plunger is preferably fastened to a movable part of a pressure-exerting means, such as a hydraulic press, or the plunger may be stationary and the die be movable.

EQUIPMENT

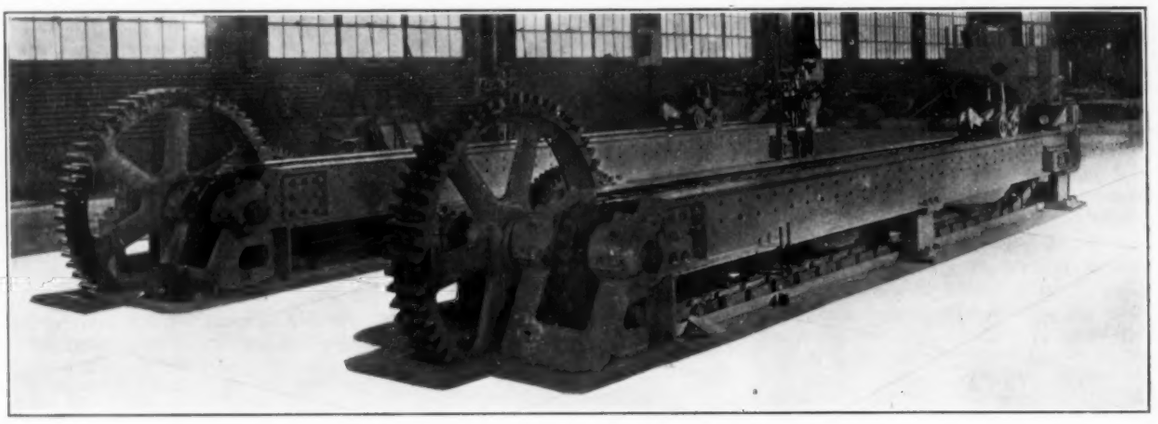
NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

A NEW DRAW BENCH

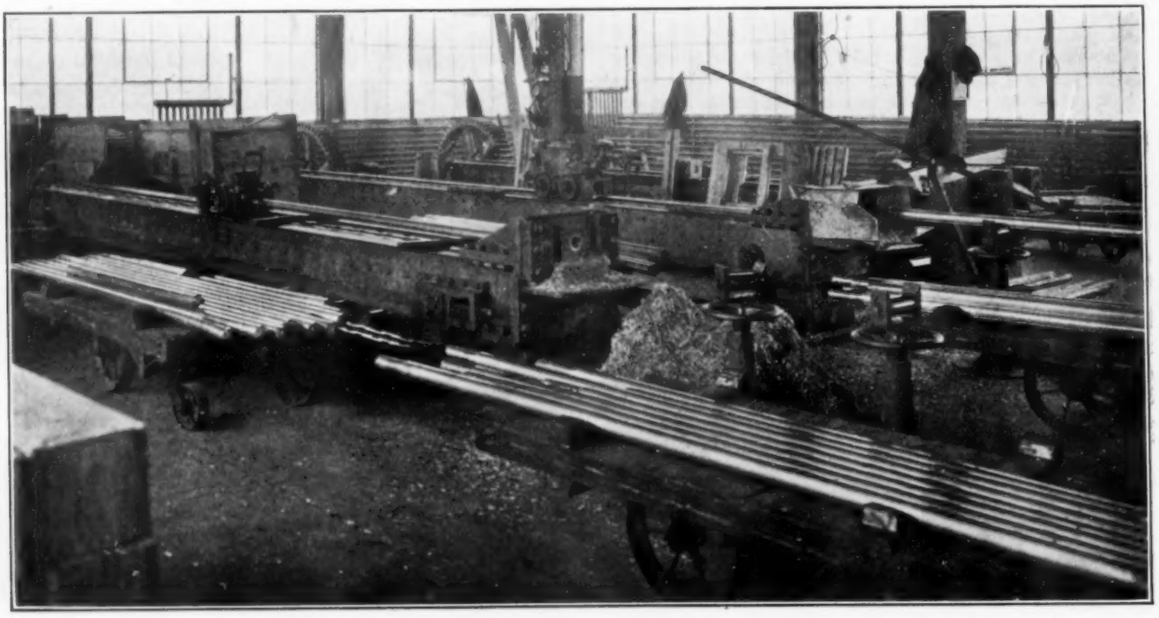
By E. R. Sheldon.*

The conditions which have existed in American manufacturing during the past two and a half years, have brought about the necessity of heavier and more efficient machinery. During this period there has been an unprecedented demand for large diameter brass rods, tubes, etc., and with the object of producing these materials economically, and in large tonnage, the Continuous Casting Corporation, of Garwood, N. J., Granville Mellen, president, has perfected and is using a heavy chain draw bench of their own manufacture which, on account of its heavy construction and excellent design, should prove of interest to manufacturers throughout the United States who require such equipment. These benches have been designed and built, after a thorough study of actual working conditions, by Mr. Haydock, chief engineer of the Continuous Casting Corporation, and he has embodied in them all of the essential features which tend to produce a machine that will give steady and efficient service, with the largest possible production, at small upkeep.

The bed of these benches is constructed of three heavy I-beams, which makes a very rigid machine, free from vibration, and the three heavy cast-iron supports which hold the bed are so placed as to insure the greatest possible rigidity. All of the cast parts are made with heavy sections, and where the greatest strain comes, steel castings are used which are amply heavy to withstand any strain for which the bench is intended. In order to carry the maximum load, ample allowance has been made for a heavy overload. The chain is made of steel links, 4 in. by ⅞ in., with steel pins 2⅛ in. body by 2 in.



THE NEW DRAW BENCH FOR RODS AND TUBES.



THE NEW DRAW BENCH AT WORK AT THE CONTINUOUS CASTING COMPANY'S PLANT AT GARWOOD, N. J.

*Of Wm. O. and E. R. Sheldon, New York.

ends. The gearing is of extremely heavy pattern machine-molded cast iron, with steel pinion. Ample provision has also been made for taking up slack in the chain, and compensating for any wear. This draw bench, in fact, is self-contained, and special effort has been made, in its construction, to provide for contingencies in the process of manufacture.

These benches are built in the standard length of 25 feet between centers, but the heavy, or 50,000-pound capacity, can be built in any length up to 80 feet, if desired, and the lighter bench is of similar construction, and can be in any length up to 60 feet. The cost for the additional length over the 25-foot standard, owing to the form of construction, is merely a nominal one. These benches are designed to be either direct-driven from motor, or, as is being done in many cases, they can be driven by link belt drive, which the manufacturer believes to be the most practical means of driving a bench of this sort. They can also be built for belt drive, if desired, and can also be furnished either right or left hand.

The 50,000-pound capacity bench requires 35 horse-power motor, and for ordinary use in drawing brass rods or tubing, it is designed to make a chain travel of about 36 feet per minute. The grip car is equipped with roller bearings, making it easy to handle, and an automatic trip insures the grip car being disengaged at the proper time.

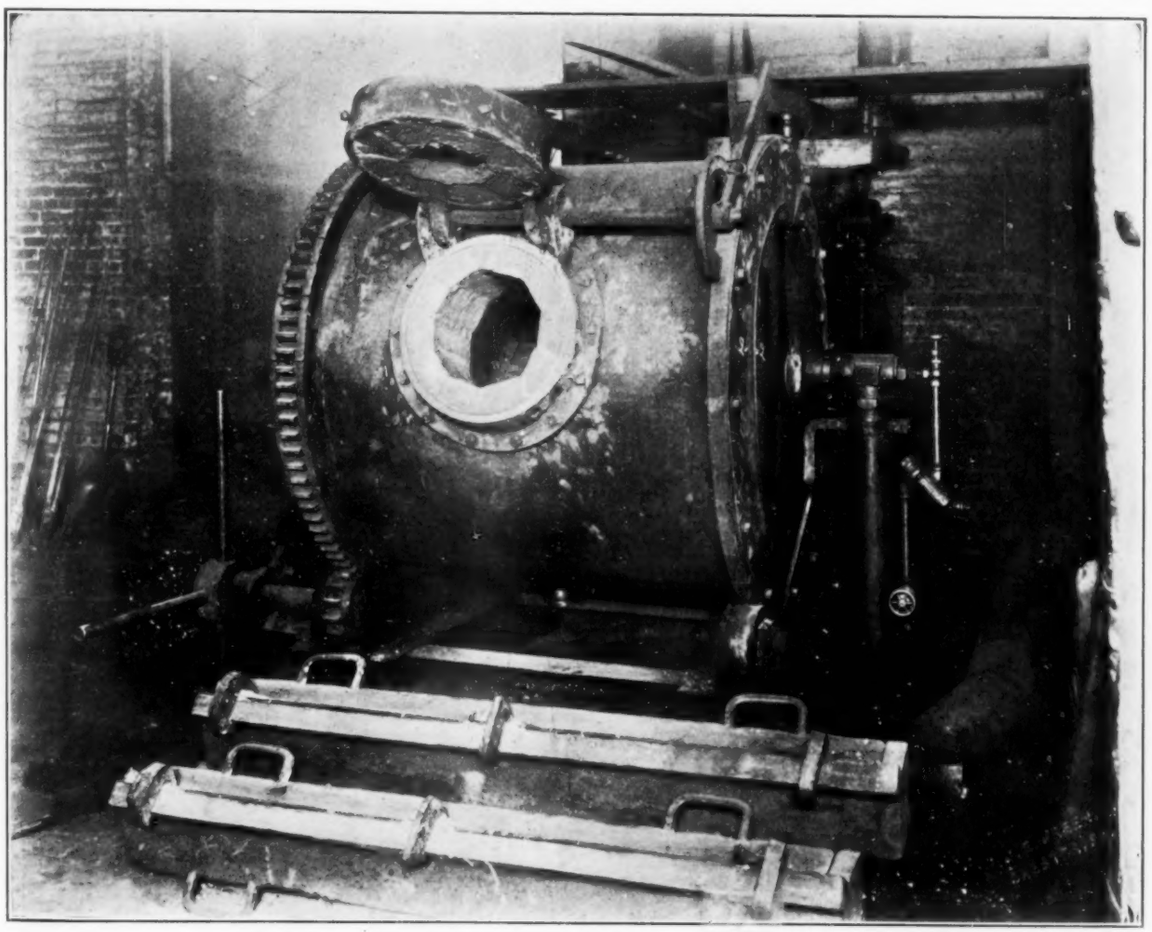
While these benches were designed primarily by the Continuous Casting Corporation for their own use, they proved so satisfactory when placed in actual operation that the builders decided to continue the manufacture of them for the trade. In looking about for a medium for marketing these benches, they placed the matter in the hands of William O. and E. R. Sheldon, 253 Broadway, New York City, whose acquaintance with the metal working trades enables them to get in touch with all the leading manufacturers of brass, steel and copper tubing, and also with the manufacturers of brass, copper and steel rod and shafting.

In the past two months these benches have been inspected by the engineers of several brass and steel mills, and in each instance have been pronounced satisfactory in every way, and through the efforts of the selling agents many orders have been taken and prompt shipment of the machines has been made. William O. and E. R. Sheldon, selling agents for these benches, would be glad to communicate with anyone in need of a bench of the description given, and will gladly go into details of construction and capacity, if called upon.

NEW OIL FIRED TILTING FURNACE

The Ideal Furnace Company, Chester, Pa., has just placed upon the market the furnace shown in the cut. This furnace is a non-crucible oil fired tilting type operated under practically the same principles as applied to all furnaces of its class. While the furnace is only built to produce a heat of a thousand pounds, it will hold fifteen hundred pounds and requires but from 1½ to 2 gallons of oil for melting 100 pounds of pure copper.

One of the features about this furnace is the burner, this being a low-pressure Anthony burner using a ten-ounce pressure of air for getting results while a steady pressure of fifteen pounds or upwards is required on the oil line. The Ideal Furnace Company make the statement that they have evolved this particular furnace due to the conditions in the crucible market and the insistent call by their customers for a furnace of reasonable cost.



THE IDEAL OIL FIRED TILTING METAL MELTING FURNACE AT THE PLANT OF THE CROWN SMELTING COMPANY, CHESTER, PA.

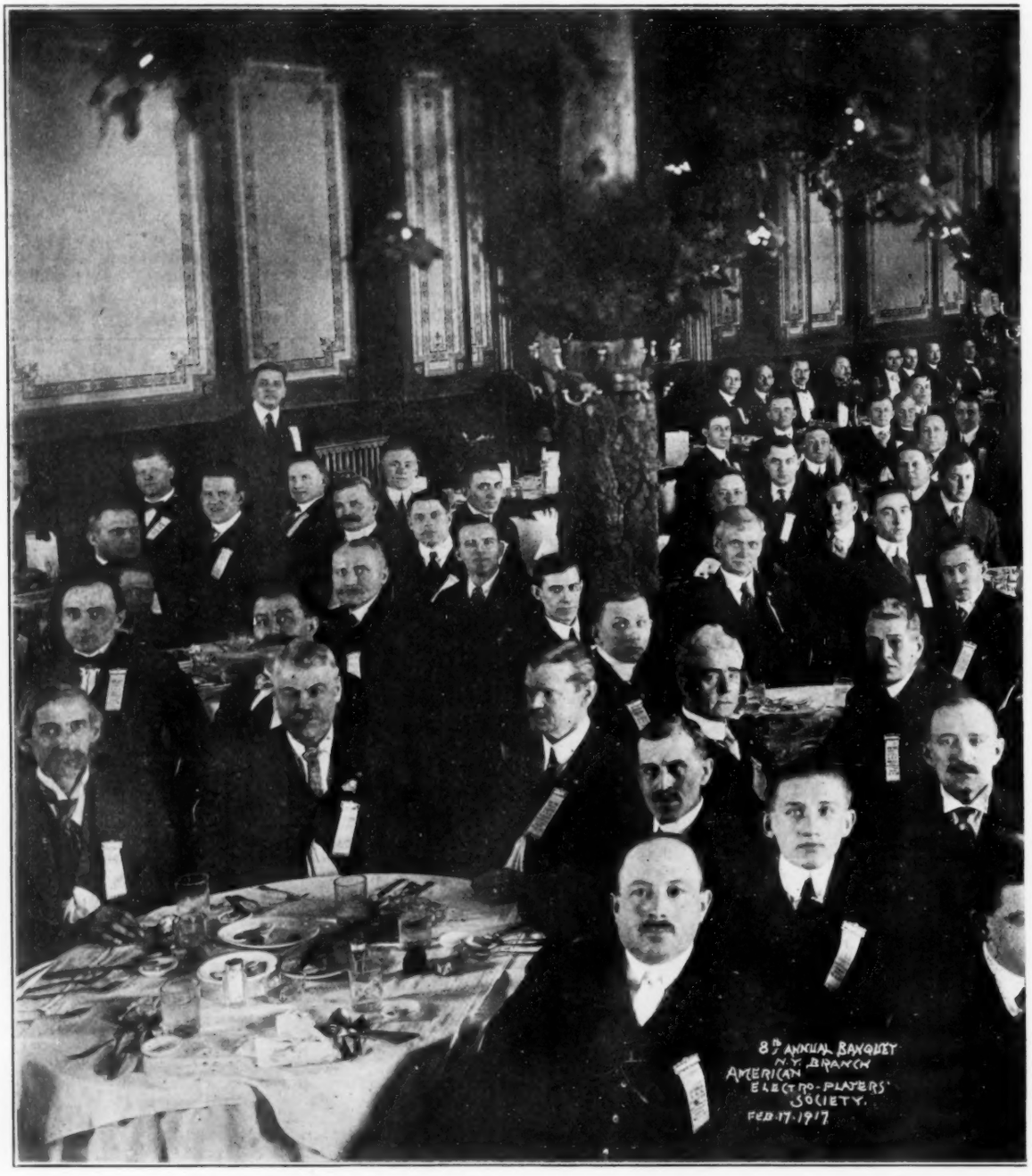
ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

THE NEW YORK BRANCH OF THE AMERICAN ELECTRO-PLATERS' SOCIETY HOLD EIGHTH ANNUAL BANQUET

The eighth annual banquet of the New York Branch of the American Electro-Platers' Society, which came to a close shortly before midnight at the Broadway Central Hotel on Saturday, February 17, marked the successful culmination of the efforts of the members of the various committees to whom had been entrusted the arrangements for the banquet. These committees were made up as follows:

The Banquet Committee.—William J. Schneider, chairman; Thomas B. Haddow, C. H. Buchanan, Joseph Minges, John E. Sterling, William Fischer, J. A. Stremel, William Betz, J. A.



THE EIGHTH ANNUAL BANQUET OF THE NEW YORK BRANCH OF THE AMERICAN ELECTRO-

Straub, R. E. Massicotte, O. C. Moller, Frederick Haushalter.

The Space Committee.—T. B. Haddow, chairman; C. H. Buchanan, Joseph Minges, J. E. Sterling, William Fischer.

The Arrangement Committee.—H. E. Flanigan, chairman; N. E. Dabolt, G. J. Karl, Harry Maynard, Joseph Haas, Jr., O. C. Moller.

The Reception Committee.—Benjamin Popper, chairman; William Voss, Joseph Minges, William Betz, Thomas Brown, S. Schubert, J. A. Stremel, M. E. Stewart, H. C. Bernard, John Loeffler, W. R. Shanks.

The officers of the New York Branch are as follows: H. H. Reama, president; John Painter, vice-president; William Fischer, secretary-treasurer; Frederick Haushalter, recording secretary; William Betz, sergeant-at-arms; J. E. Sterling, assistant sergeant-at-arms; J. A. Stremel, librarian; William Voss, laboratory chairman.

The members of the New York Branch, together with the delegates from out of town and other guests, were to be seen around the hotel early in the afternoon, the chief interests of their attendance being to renew old and make new acquaintances and friends and view the exhibit of platers' supplies and apparatus which was held in the hotel by manufacturers and agents.

In a room on the second floor of the hotel devoted for that purpose various collections of plating apparatus and supplies were arranged in simple fashion so that they could be closely inspected and their various features explained and pointed out by the attendants. These exhibits and exhibitors were as follows: James H. Rhodes & Co., New York, had an extensive exhibit of felt, pumice stone and metal cleaner known as Carlsruhe.

The Taylor Instrument Company, Rochester, N. Y., had on exhibition its Tycos regulator for regulating the temperature of potash kettles and plating baths. The U. S. Electro-Galvanizing Company, Brooklyn, N. Y., exhibited their pickling and cleaning apparatus. The Celluloid Zapon Company, New York, N. Y.,

PLATERS SOCIETY HELD AT BROADWAY CENTRAL HOTEL, NEW YORK, FEBRUARY 17, 1917.

had an exhibit of samples of their colored celluloid lacquer enamels and quick drying lacquers which are known to the trade as Zapon.

The Wyandotte metal cleaner was exhibited by the manufacturers, the J. B. Ford Company, of Wyandotte, Mich. The Mogul Company, New York, N. Y., had an exhibit of acid proof paints and varnishes. The Ideal Air Brush Company, New York, N. Y., had an exhibit of their air brushes for finishing metals, etc. The De Vilbiss Company, Toledo, Ohio, also had an exhibit of air sprayers. The Oakley Chemical Company, New York, had an exhibit of Oakite and samples of material cleaned with Oakite. Moller & Schumann Company, Brooklyn, N. Y., had an extensive exhibit of varnishes and enamels and also samples of work finished with their products. P. Mahler & Sons, New York, N. Y., exhibited machine and circular brushes for silversmiths, silver and nickel platers use, also brass and steel wire brushes of all descriptions.

While the Roessler & Hasslacher Chemical Company, New York, N. Y., did not have an exhibit of their products they distributed booklets relating to Trisalyt.

J. De Mar, of Newark, N. J., exhibited samples of articles finished in black nickel.

Contrary to usual custom and it must be recorded as an agreeable surprise, Chairman William J. Schneider, of the Banquet Committee, with his customary energy had everybody seated in the dining room at 7:15 and by 7:30 the dinner was in full swing. President Reama made a brief address of welcome to the platers and their friends and at the close of the dinner he introduced Mr. Schneider as the toastmaster of the evening. Mr. Schneider, after reading telegrams and messages from members and well wishers who were unable to attend, proceeded to introduce Professor Charles Baskerville, of the College of the City of New York, as the first speaker of the evening.

Professor Baskerville spoke in a simple, direct and forceful manner on the part that chemistry is playing in the great war. He called attention to the tremendous advantage that accrued to the powers that control the nitrate mines of Chili and stated that the European war was deferred just about six years due to the fight for control by the powers for this important chemical, but he said as soon as it was found possible by chemists to take the nitrogen out of the air so that saltpeter could be made artificially, so to speak, the war was immediately precipitated. The professor characterized the war as being a chemical war or one which used the deadly results of the mixing of chemicals and he claimed that it demonstrated that the chemists were most important factors both in times of war and peace.

Professor C. W. Bennett, of Cornell University, was the second speaker, and his speech was confined to remarks on theoretical and practical research as applied to electro-plating. By this he claimed that practical or commercial research is divided into two parts, the first of which consists in trying to manufacture a raw product, and the second, substituting a product for one already in use. He made a strong appeal to the assembled members and urged them to make great efforts to reconcile theoretical and practical research in the electro-plating operations in order to perfect new articles, chemicals and tools and substitute others for products which it is now impossible to obtain.

Dr. Hiram S. Lukens, of the University of Pennsylvania, was the third speaker, and he told some very interesting chemical facts relating to nickel plating on tin. His address was followed very closely by the platers and, as usual with Dr. Lukens, he spoke in simple language that was easily understood by all.

The last speaker was George B. Hogaboom, and he gave a very spirited talk on "The Awakening of the Electro-Plater." The principal gist of Mr. Hogaboom's talk was that he thought the time had now come for the plater to give up guessing and utilize the apparatus and tools placed at his disposal by science in a common sense and scientific manner.

Rochester Branch—C. V. Haring, secretary, 603 Dewey avenue, Rochester, N. Y.

This branch is actively engaged in electric chemical work and many of its members are taking advantage of this opportunity of making themselves of more value to their firms. Frank Kolb is the instructor of the class. The Rochester Branch will hold its annual banquet at the Osborne House on March 24, and all members of the different branches who may be in Rochester on that date are cordially invited to attend.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

G. A. McGloin is in Seattle, Wash., opening up a new branch of the E. J. Woodison Company, manufacturers of foundry, platers' and polishers' supplies, Detroit, Mich., in that city.

E. Carlson, for the past two and one-half years assistant superintendent with the Stewart Manufacturing Company, Chicago, Ill., has resigned to accept a position as chief engineer with the Indiana Die Casting Company, Indianapolis, Ind.

M. S. Herman, formerly connected with the Chicago office of the Roessler & Hasslacher Chemical Company, of New York, has now become connected with the American Air Brush Company, 180 North Dearborn street, Chicago, Ill.

T. C. Eichstaedt has become connected with the U. S. Electro-Galvanizing Company, manufacturers of electro-galvanizing and plating apparatus, Brooklyn, N. Y., as salesman for the states of New Jersey, New York and Pennsylvania.

A. W. Hartigan, of the New York Sales Department of the Western Electric Company, has been appointed sales manager of the Electrical Alloy Company, with headquarters at 41 Union Square, New York, where all communications pertaining to sales should be addressed. The Electrical Alloy Company is now occupying its new modern fire-proof factory building which has just been completed at Morristown, N. J., which will enable them to vastly increase their production.

DEATHS

Charles Miller, president Randolph-Clowes Company, Waterbury, Conn., died at his home in that city, February 6, aged 70 years. He was for many years a prominent merchant in Waterbury, retiring from that branch of trade several years ago to buy an interest in the Randolph-Clowes Company, later becoming sole proprietor of the business, which thrived greatly under his administration.

Captain Richard Sherwood Satterlee, Ordnance Officer on the staff of Maj. Gen. O'Ryan, died February 20, in the morning, at his home, 103 East Eighty-sixth street, New York, as the result of exposure connected with military duty. He was born here and was in his fifty-seventh year. He was a son of the late George B. Satterlee and a brother of Herbert L. Satterlee. Captain Satterlee served in the Spanish war and later was appointed by Governor Roosevelt a First Lieutenant in the Twelfth New York Regiment, and went to Cuba with that command and served in the Army of Occupation. On his return here he joined the Habirshaw Wire Company, of which he became president in 1911. Upon the reorganization of the company into the Habirshaw Electric Cable Company, Captain Satterlee became vice-president.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

MARCH 5, 1917.

The month of February has been one of uncertainty and anxiety in some of the leading industries of this district, but, on the whole, it has been a month of progress and development. Even the few circumstances, which have indicated how perfectly harmonized with international conditions some industries are, have tended to prove the strength of industries here, the security of the labor market, and the general prosperity of domestic business in most of the manufacturing industries.

It was owing to the stagnation of ocean traffic and the consequent accumulation of freight and extension of embargoes that a few developments were recorded here, which indicate that the high wave of prosperity, which is so generous to the shop-hand, now is largely depending on steady and reliable freight transportation. One day in the middle of the month several hundred hands were suddenly laid off, temporarily, in the big plant of the Scovill Manufacturing Company. Next day some more were laid off, and on divers days throughout the month there have been temporary suspensions from service of hundreds of hands. Upwards of 2,000 are enjoying such a vacation this week, but with orders to report to the employment bureau again Monday (March 5). There have been some hands laid off temporarily at the plant of the Chase Metal Works also.

There is plenty of work, however, at all factories. The numbers laid off would seem exceedingly large three years ago, but that now it is a very small percentage.

There is much anxiety over the international situation, but there is no lack of patriotism. The governor of Connecticut asked for a census of the man power of the state, and Waterbury has responded splendidly, as well as all other towns in this vicinage. It is believed that there will be an industrial census completed also within the present month. These steps are taken as preparedness measures, the state authorities realizing that, with its great factories for production of copper and brass wares, Connecticut is sure to be a war prize if this nation engages with a hostile foe, and that most of her great industries will have to be operated at their best in case of any conflict in order that the nation may be properly supplied with munitions. The older residents recall that the Civil war brought a great boom to this town when it had only a few thousand inhabitants, and was to be found on few maps.

The watch industry is booming in Waterbury, business at the Waterbury Clock Company being so great that it is pressed to keep up to its orders. The new Ingersoll factory, where the Ingersoll-Waterbury is produced, is also operating full speed with plenty of orders. Novelty business also is enjoying continued and growing prosperity. Foundry and machine shops have all the work they can attend to, and the wire and pin plants are operating at capacity.

By the death of Charles H. Miller, the controlling officer of the Randolph-Clowes Co., the business is not disarranged. The Colonial Trust Company is trustee of Mr. Miller's stock. His son-in-law, Ralph H. Smith, one of the executors under the will, will probably take his place in such offices and directorates as he occupied.

Work has begun to prepare the site for the fine new office building of the Chase Metal Works, the Chase Rolling Mills and the Waterbury Manufacturing Company, opposite the new city hall on Grand street. The handsome new East Main street factory buildings of the Scovill Manufacturing Company were completed during the early part of the month. Extensions of the Chase properties in Waterville continue. The American Brass Company a few days ago presented the city with a considerable portion of land containing the site of the first brass mill in the city, on which the old water wheels of the plant stand, to be used for park purposes. The A. H. Wells Company has added some four acres to its property in the west end of the city. A large portion of the old golf lots has been acquired for extensions by the American Brass Company. These are suggestions as to the local industrial outlook.—F. B. F.

NEW BRITAIN, CONN.

MARCH 5, 1917.

New Britain, the hardware center of Connecticut, termed by Governor Holcomb the arsenal of the country, is now closely guarded, particularly its factories, as the result of a most atrocious attempt to raze the city by fire on the night of February 21. Fortunately none of the fires which menaced the business section of the city reached any of the large factories, but it is possible that this was due materially to the prompt cordon of guards that were immediately thrown about them. Now the large factories are closely watched by armed guards at night, while huge searchlights, mounted on tops of the high buildings, are played about the factory yards. While this city is not essentially a munitions manufacturing center, in case of war its plants could be converted into auxiliary munitions works. For instance, the New Britain Machine Company manufactures machines used extensively in turning out munitions; the Corbin Screw corporation and the P. & F. Corbin Company have both held sub-contracts for munitions works and the Stanley Works has had orders from the Russian government for the manufacture of a part of a shell. In addition the North & Judd Manufacturing Company turns out all sorts of army accoutrements, such as halter straps, buckles, etc. To better understand the immense manufacturing plants located here it might be explained that of the many metal manufacturing concerns there are sixteen, assessed at more than $20,000, and of this number five are assessed at more than one million dollars. These are the American Hardware corporation, taxed at $7,196,400; Stanley Rule & Level Company, $2,551,900; Landers, Frary & Clark, $2,397,000; Stanley Works, $2,253,400; and the North & Judd Manufacturing Company, $1,090,500. The latest manufacturing company to locate here is the recently organized Colonial Brass Company. While there is no labor trouble here, and business is rushing in all of the factories, each concern is beset with traffic troubles which cause considerable worry over delivery of orders.

The annual meeting of the American Hardware Corporation was held on March 2, when reports received showed a net profit for the year amounting to $1,501,923.12 and a surplus increase of from $1,712,376.93 to $2,474,788.24. These figures indicate plainly the enormous amount of business handled by this corporation. The Union Manufacturing Company has also held its annual meeting, re-electing A. F. Corbin, president; M. L. Bailey, treasurer; H. H. Wheeler, secretary; and C. S. Neumann, assistant secretary. Old officers were re-elected at the meeting of the Stanley Works and the old staff of officers at the New Britain Machine Company were re-elected at the annual meeting. This concern, which has been thriving, has declared a stock dividend of twenty-five per cent and has also increased its capital stock from $800,000 to one million dollars. Factory additions are to be started immediately at several concerns. Landers, Frary & Clark is building a new structure and the New Britain Machine Company is to build a two-story addition to its five-story factory building. The Stanley Works is to erect a new storehouse at a cost of $125,000. This building will be of brick and concrete and will be eight stories high and measure 85 x 130 feet.

Of vast interest to the manufacturing world is the information that within the past few weeks agents, purported to be from the Du Pont Powder Company of Wilmington, Del., have spent considerable time in this locality looking over land with the view, it is said, of erecting a large storehouse for the company.

The metal market is still a source of speculation to the manufacturers here. The brass output at the Bristol Brass Company

is greatly in demand. Copper, even at its high prices, as well as aluminum, bronze, high grade steel, nickel and silver is used extensively at the Landers, Frary & Clark plant. As yet this concern has not been embarrassed in obtaining a sufficient quantity of any of these metals. The jewelers, of whom there are several large firms here, have sufficient gold and silver as well as platinum on hand and do not fear any dangerous shortage.—H. R. J.

HARTFORD, CONN.

MARCH 5, 1917.

In consequence of the severing of diplomatic relations with Germany and because of the recent activity of a "firebug" in the city all of the Hartford factories have increased the number of night watchmen employed and have hired supernumerary policemen to guard their property, but business in the metal trades continues to prosper, the one drawback being the scarcity of help.

President William C. Skinner, of the Colt's Patent Fire Arms Manufacturing Company, recently returned from Washington, has provided the War Department with complete information concerning such rapid fire guns and automatic pictols as can be turned out by the Colt company. Colonel Skinner has assured the War Department that in case of war the company would cancel a large part of its commercial business. It has been through two wars and in each has put all its facilities at the disposal of the government and will be prepared to do so again.

A petition of the Colt company to amend its charter authorizing an increase in its capital stock to $10,000,000 was given a hearing by the committee on incorporations at the State Capitol last week. President Skinner and director and counsel Lewis Sperry, represented the company at the meeting. Mr. Sperry declared the company was wonderfully solvent and prosperous, employing 3,800 men as against 800 men before the European war. It was also brought out at the hearing that the company is supplying nine different countries with guns and has $4,000,000 cash on hand.

It is reported that the Franklin Electric Manufacturing Company is soon to leave Hartford and move to Middletown, where the company has a branch factory, but plenty of room to expand. The directors and officers of the company were re-elected at the annual meeting held Wednesday, February 14. The directors are Jonathan Camp, John W. Morrell, John A. Butler, Arthur L. Shipman and Charles L. Spencer. The directors re-elected the following officers: Jonathan Camp, president and general manager; John A. Butler, treasurer; Helen Brink, assistant treasurer; J. W. Morrell, secretary, and Peter S. Klees, assistant secretary.

At the annual meeting of the National Machine Company the stockholders authorized an increase of $40,000 in the capital stock from $60,000 to $100,000. This is said to have been made necessary by the increased business of the company and the alterations which are deemed necessary. The following officers were re-elected: S. M. Weatherly, president; Edward D. Redfield, vice-president; William F. Loomis, secretary and treasurer; F. J. Palmer, assistant secretary; S. M. Weatherly, Edward D. Redfield, William F. Loomis, H. J. Stach, Fred C. Billings, Silas Chapman, Jr., and Horace H. Ensworth, directors.

Lucius F. Robinson and Ferdinand Richter were added to the directorate at the annual meeting of the Billings & Spencer Company on February 14. The old directors were re-elected as follows: C. E. Billings, F. C. Billings, C. M. Spencer, Silas Chapman, Jr., L. D. Parker, E. T. Stocker and Fred P. Holt. The total number of directors is now nine. The directors re-elected the officers as follows: President, C. E. Billings; vice-president and general manager, F. C. Billings; treasurer, L. D. Parker; secretary, E. H. Stocker; assistant secretary and treasurer, F. H. Stocker. The balance sheet as of December 31, 1916, shows fixed assets of $1,150,079.17; current assets of $1,237,826.16; securities owned of $47,606.75, and deferred charged and items prepaid of $13,517.19; grand total, $2,449,029.27. The net profit for the year was $669,246.19 and the final surplus is $1,452,947.04. The dividends paid in 1916 were $82,500.

Pratt & Whitney Company have elected the following officers for the ensuing year: President, James K. Cullen; vice-president, Thomas C. Gaff; directors, Amos Whitney, R. C. McKinney, A. C. Stebbins, T. T. Gaff, C. L. Cornell, Francis G. Echols, James Cullen and B. M. W. Hanson.—T. C. W.

PROVIDENCE, R. I.

MARCH 5, 1917.

All lines in the metal industry continue on the jump, with perhaps a slight slackening off with some of the concerns that have been engaged in the manufacture of supplies for the belligerents in the European war, especially those turning out munitions. But on the whole there is little, if any, let-up in the general conditions. The industry has enjoyed two years of unprecedented "driving" business and the present indications are that there will be steady work for months to come. Among the jewelers business is brisk, but not booming, and practically every manufacturer, no matter what his line or grade of production is, has a good book of orders ahead and as many employes as he can hire. Like every other line of industrial operation, the help problem continues to be the great handicap. It is many years since the manufacturing jewelers have been so genuinely optimistic and the principal reasons for this are not because of more business on hand or in prospect, but because of the fewer failures in the trade and the closer conformity to trade terms than ever before and the improvement in collections.

The Fairmount Foundry Company, a new manufacturing concern at Woonsocket, made its first pouring the past month. The company will manufacture gray iron castings for the present, but as soon as possible plans to install a large crucible and make brass castings. The new concern has two buildings, the foundry being 100 by 70 feet, one story, with monitor roof. It has a cupola capable of turning out ten tons of molten metal an hour. Camille Belisle has been appointed superintendent of the plant, which occupies a site adjacent to the railroad, comprising 45,000 square feet of land.

The Universal Metal Company is the style of a new manufacturing concern that has recently started in business at 220 Eddy street, this city, under the ownership of Samuel Brier.

The trade certificate of the Star Electroplating Company, doing business at 43 Knowles street, Pawtucket, has been filed with the city clerk's office in that city. The name of the owner is given as Jeremiah J. Hanley.

The Franklin Specialty Manufacturing Company, of Providence, has been incorporated under the laws of Rhode Island with an authorized capital of $50,000 to make and sell adjustable light holders and other devices. The incorporators are Julian Franklin and Victor E. Black, of New York, and Samuel B. Levy, of Providence.

The Gorham Manufacturing Company, after many months on special contracts for shells, cartridges and other metal work for the Entente forces, is gradually nearing the end thereof and has been discharging several hundred of its extra help. The company has a large plant at its works at Elmwood specially equipped for the manufacture of munitions and would be in a position to furnish such materials to the United States Government if called upon. There would, however, be some delay in the starting of actually turning out munitions for the home government because of the necessity of making dies, tools and machinery to the measurements and requirements of the United States. Meanwhile the company is daily receiving large numbers of contracts in its bronze and silverware departments that insure steady operations for months to come. It has just received the contract for the architectural bronze, fine ornamental ironwork and all the silverware for the Hotel Commonwealth that is to be erected in New York City. The contract is one of the largest ever given to a single concern in this country and is said to amount to several hundred thousand dollars.

The Secretary of State has issued a charter under the laws of Rhode Island to Arthur M. Allen, Frederick W. Tillinghast and Rush Sturges, in the name of the Union Metal Goods Company, with a capital of $25,000, to do a general metal business. The corporation will have its headquarters in Pawtucket.—W. H. M.

BOSTON, MASS.

MARCH 5, 1917.

The freight congestion in New England has continued to tie up business in general, and especially the large manufacturers, during the past month, and so far as can be foreseen there is

not much prospect of relief for some time to come. Representatives of metal trades have been in conference with officials of the roads, and a larger supply of cars has been promised. Severe weather in the north and in New England, the inability of connecting lines to handle cars, congestion of home lines, freight embargoes and occasional shortage of power, were the principal reasons assigned for the lack of transportation facilities.

Lack of coal, too, has caused considerable uneasiness among manufacturers, and some have already been seriously handicapped as a result. It is satisfactory to note, however, that no foundry or other metal plant has been compelled to close, though naturally some curtailment of output has ensued.

Several big manufacturing concerns specializing in tools are doubling their efforts to supply the various factories of munitions for the government. Among the most urgent requirements are special drills, taps and grinding wheels. In this direction it should be stated that the Herald Machine Company, of Worcester, manufacturing machine tools and grinding machinery, at its annual meeting recently, voted to increase its capital stock from $100,000 to $250,000 to take care of its increasing business, due in large measure to the European war.

At the present moment international issues still are in the balance, but whatever the outcome it is probable that business has but two depressing factors to anticipate, aside from freight embargo, namely, a complete success of Germany's submarine campaign, shutting off exports drastically, and declaration of peace, which would have a bearish tendency.

An indication of the healthy condition prevailing in the metal industry trade is furnished in the opening up shortly of an industrial national bank in Boston. The comptroller at Washington already has approved the application for a charter. The initial capital and surplus aggregate $600,000. When opened the bank will be equipped with a savings department, foreign exchange as well as transfer and other departments, to meet the requirements especially of manufacturers. Further signs of the prosperous times are evident in the formation of two or three new companies relating to the metal trade. These include the Oro Zinc & Lead Company; capital, $500,000; president, Arthur W. Pope; treasurer, Malcolm Green; clerk, Arthur L. King, all of Boston; the Lynd-Farquhar Company, machine tools; capital, $100,000; president, Robert J. Lynd, Somerville; treasurer, Charles S. Farquhar, Boston; clerk, Arthur P. Teele.

Two hundred employes of the Blake & Knowles Steam Pump Works, of Cambridge, tendered a farewell banquet at Young's Hotel, February 10, to T. H. Hermanson, for nine years superintendent of the plant. Mr. Hermanson leaves to take up a position with the Henry R. Worthington Company, of Harrison, N. J.

Among those to suffer material loss in an extensive fire February 2, in the seven-story building at 421 Atlantic avenue and 82 Purchase street, Boston, were the Eagle Metal Works, successors to the Hodgdon Brass Works; the George H. Priggen Company, makers of sheet metal, and the Shipman Machine Company.

The Wright Wire Company, of Worcester, Mass., has completed plans for the construction of two buildings at its Palmer plant. One will be used as a rod mill, the other as a drying, cleaning and annealing house.—R. T. E.

ROCHESTER, N. Y.

MARCH 5, 1917.

Despite the fact that manufacturing was apparently never so healthy in Rochester, it is well known that plants are absolutely bare of materials. The railroad situation, with its serious car shortage, is playing havoc with Rochester concerns, and while orders are continuing to pour into the big plants throughout the city, the mails are carrying back contracts that have been of necessity refused.

As a member of a prominent concern said yesterday, "We are taking care of all of our regular customers, the people who have been ordering from us for years, but we are forced to turn down every one else. We do not like to do this, but are forced to do so by the car and metal situation."

Rochester manufacturers say they do not expect any relief in the matter of obtaining such metals as aluminum and copper until such times as shipments may be obtained from abroad. So long as the war continues metal users hereabouts are bound to be short. Users of aluminum have been falling back on stocks stored in warehouses in the city for more than six months, and find it impossible to make renewals. Practically all of this metal is shipped to this city from Pittsburgh, and owing to the car shortage deliveries will not be promised better than thirty days. Prices are very stiff at this time. Some aluminum contracted for a year ago has been delivered here since January 1, but it was in limited quantity.

Prices of all metals have gradually worked upward during the past month, and the demand and consumption have not abated among local users. Sheet copper is quoted at 44c. for large quantity and 46½c. for small lots. Sheet zinc is strong and held at 22c. Brass is higher. Base yellow brass sheets and rods are quoted at 38½c. Scrap brass is quoted at 18c. and scrap copper at 28c.—G. B. E.

CLEVELAND, OHIO

MARCH 5, 1917.

Metal industry plants of Cleveland and all Cuyahoga county are watching with interest the progress being made by the Tinker creek reservoir bill, introduced in Columbus this month by Representative Reynolds. Upon the passage of this bill may hinge the cost of doing business in these plants. So rapidly has this branch of industry grown in this territory in the last two years, that there is not sufficient water available to the shops at present cost. This seems ambiguous when it is considered that the city and county have the entire Lake Erie to draw water from. The cost, however, must be reckoned when piping, pumping, and other figures on carrying the water miles inland must be considered. Shop owners have got to the point where they will not pay this cost. To preserve to Cleveland and its adjacent territory all the good business that has come from other cities in the last two years, it is proposed to construct an artificial lake, seven square miles in area, to the eastward of the city. This lake would accumulate the drainage of forty-five square miles in Cuyahoga and adjoining counties and would overflow from a 300-foot dam. The total cost of the project is estimated at $1,000,000. The cost of delivery of the water to the many plants in the district would be practically nil.

War aeroplanes will be provided for the United States Government in case of hostilities with Germany, according to plans presented at Washington by Edmund E. Allyne, president of the Aluminum Castings Company, of this city. Mr. Allyne, on his return from the capital, said he had offered the production of his five plants to the government for use in aeroplane and automobile construction.

The Monarch Brass Company has prepared plans for a $100,000 factory on the East Side on property recently purchased from different holders. Improvement will start this spring. The old Payne avenue factory will be sold.

Further expansions by established metal industry firms is noted this month. The Eagle Brass & Bronze Company has acquired a two-story building on the South Side, and the United States Lead Plating Company has taken additional space in property on the West Side.—C. C. C.

COLUMBUS, OHIO

MARCH 5, 1917.

Firmness characterizes the metal market in Columbus and central Ohio territory. Conditions have changed considerably from the former month on more active buying in every line. Supplies are rather good, although the railroad congestion is holding up shipments to a certain extent. The tone of the trade is generally satisfactory and prospects are unusually bright.

Consumption of all metals in Ohio territory apparently shows an increase over the former month. This is especially true of automobile concerns. Type metals and Babbitt are especially strong and the demand is better than usual. New metal using concerns are springing up in almost every locality, which insures a good demand for the spring at least.

Brass is in extra good demand and prices have advanced during the past month. Scrap red brass is selling at 26¼ cents, while yellow scraps are selling at 20 cents. Copper is also strong, being quoted at 31 1-3 to 32 cents. Aluminum is one of the strongest points in the market and is quoted from 48 to 50 cents. Zinc is about the only metal which has not shown any advance recently. Lead is up and the same is true of tin and spelter. Other metals rule firm in every locality.—J. W. L.

CINCINNATI, OHIO

MARCH 5, 1917.

The activity of Cincinnati plants making machinery for the manufacture of munitions, as well as those more directly concerned, received a sharp stimulus from the recent threatened trouble with Germany, which it is conceded will be certain to induce the government to push preparedness measures. Aside from this, general business conditions, as far as orders go, have never been better. All lines, from building to banking, are exceptionally prosperous, and orders coming to the metal trade are correspondingly large. The car and transportation situation is extremely bad, however, and has hampered operations in all lines, hindering the delivery of raw materials to the plants and foundries and the movement of finished products. So far no relief is in sight, although the efforts of a Cincinnati committee of business and railroad men have been successful in relieving the congestion here to some extent. Indications are that if the transportation condition is improved the coming spring will be the most active the trade ever had, excepting, perhaps, that of 1916.

Union Metal Manufacturing Company, of Canton, O., has purchased additional land near its plant for use in future expansions of the business, officers of the company stating that it will probably not be used soon.—K. C. C.

DETROIT, MICH.

MARCH 5, 1917.

The coal shortage and the scarcity of cars are hampering manufacturers of brass, copper and aluminum products as never has been experienced before in the history of Detroit and Michigan. So serious has been the situation that a shut-down of plants has been close and still may come, although the situation the last week has been considerably relieved.

Among those seriously hit by this unusual condition are the automobile and accessory plants which use great quantities of this product.

Every available space in the city is being used by the automobile companies for the storage of completed cars. Great numbers also are being transported both to the west and east "on the hoof," as it is called, when consignments are driven overland to their destinations. This can be done very easily now, but as soon as the country roads break up, these shipments will have to cease until better weather prevails.

Notwithstanding all the anxiety and close calls attending production in the brass and aluminum field, all plants are operating heavily, with no prospects of a let-up in sight, so far as orders are concerned.

The new Haroun Motor Car Company has about completed its plant at Wayne, Mich., a suburb of Detroit. A million dollars or more are now being expended for equipment. Like all other automobile concerns, this company is planning to install a brass, aluminum and gray iron plant.

The Detroit Valve and Fitting Company at Wyandotte, Mich., a suburb of Detroit, is completing an addition to its plant which will increase capacity fully one half. This company also makes malleable iron products for steam, gas and water, and also manufactures auto parts.

The annual meeting of the Michigan Copper and Brass Company was held in February. The company reports gross earnings of $11,089,000 for 1916. The directors elected are as follows: David M. Ireland, J. T. Whitehead, C. S. Mott, Hall H. Smith, Alfred P. Sloan, W. H. Chrysler, B. G. Coulter, H. J. Mallory and E. E. MacCrone.

It is reported the Detroit Copper and Brass Company utilizes 96,000,000 pounds of copper yearly while the Michigan Brass Company consumes 24,000,000 pounds.

It is reported control of the Michigan Copper and Brass Company has passed into the hands of the General Motors Company of Detroit. The new controlling interest, it is said, holds 52,000 shares and direct proxies covering 20,000 additional shares. —F. J. H.

CHICAGO, ILL.

MARCH 5, 1917.

Brass manufacturers and other metal workers in the Chicago district are keeping busy, the high rate of output established during the past year or more being well maintained. Business is continuing good, and while there are a number of flies in the ointment, so to speak, conditions are generally favorable, and the representative of THE METAL INDUSTRY found most members of the trade optimistic rather than otherwise. Some uncertainty is felt, it is true, in regard to the future, as important factors which will influence the situation to a decided extent are yet to be fully developed and their significance indicated. Until they have an opportunity to suggest what is going to happen, the attitude of metal manufacturers will likely remain conservative. One of the factors which is causing the most trouble just at present is the difficulty of getting material. This is particularly true of semi-finished goods, such as brass tubes. The mills are unable to make deliveries in quantity, it seems, and some of the local concerns, which thought that they had covered their requirements by the placing of orders some time ago, have been compelled to go into the market and pay a premium in order to get the goods which they needed to carry on their business. For instance, one manufacturer who has a contract for tubing at 47 cents was unable to get deliveries, and recently was compelled to do a little scouting to get enough material to run on. He found some small lots available for immediate delivery, and bought these, but was compelled to pay a premium, the price being 57 cents, which is quite an increase to tack on to the cost of the material, especially when the manufacturer thought that his requirements were fully taken care of by the orders which had gone in to the mills.

Local distributors of copper, brass and other materials, who usually are able to take care of orders for immediate delivery out of stock, are finding it hard to do this, as the mills are unable to keep them supplied with a large quantity of material, and that which comes in is quickly delivered to the manufacturers, most of whom are having their full share of troubles in this respect. The demand being what it is, even in the face of high prices, which might be expected to discourage buying to some extent, and supplies being far from satisfactory, Chicago metal working concerns are being compelled to watch all the points in order to keep supplied with materials.

The traffic situation is one of the features of most importance at present, and the local manufacturers report that they are being greatly handicapped by the tie-up of freight. Cars containing material which is badly needed are in transit from the mills, but they are failing to get through, and might as well not have been shipped, as far as doing the buyers any good is concerned. The car situation around Chicago is pronounced to be the worst the industrial community has ever experienced, and the tendency has been to give coal, food products and livestock the right of way. That means that the manufacturer with raw materials in transit is not being considered to any great extent, but is expected to do the best he can.

The price situation is causing considerable discussion, and while an occasional buyer is heard to express the opinion that quotations are due for a tumble, this is hardly a fair statement of the general opinion of the trade. Those who take the optimistic view that brass and other metals are going to come down shortly say that the embargoes at the ocean ports will cause an increase in the supply of material, and that the economic law of supply and demand, working its inexorable way, will force those with material to sell to offer it at lower prices. "All that goes up has got to come down," they say, and insist that the time has come for the metal market to relax from the position which it has maintained heretofore, by virtue of the unusual conditions which have been introduced into the situation. On the other hand, THE METAL INDUSTRY representative interviewed other manufacturers, who could see no hope for an improvement in this respect in the immediate future, even though they were anxious to encourage a development of that kind.

One thing that high prices are doing is to bring about substitutions. Manufacturers of automobile steering wheels, for instance, report that buyers will not follow the advance, but insist on being furnished something at the old price, even though it is not of such good quality as that which they had been in the habit of getting. This is easy to understand, for in the case of manufacturers with a large production, an increase in the price means a considerable addition to costs, in the aggregate, and they would rather put up with a slightly lower-grade product at the old price, than get the same quality at a higher price. For instance, steering-wheels which formerly brought $12 are

now selling at $15; but manufacturers say that in most cases they are not getting $15, but are making a wheel that will sell at $12, in order to take care of the expressed demand of their customers for a product at that particular price. And the tendency to substitute is not confined to the motor car trade, but is noticeable in all directions where the price of the finished product has advanced to such an extent as to embarrass the user.

Building operations in the Chicago district are of large proportions at present, so that those engaged in the manufacture of ornamental bronze work, metal plates, signs, etc., are keeping busy. The automobile trade is also in good shape, and is keeping shops specializing in this work busy, so that generally speaking the trade is in excellent condition.—G. D. C.

LOUISVILLE, KY.

MARCH 5, 1917.

In spite of high copper and other metals the demand for special castings, etc., is extremely good with the Louisville trade at this time, local conditions being prosperous, and dealers placing orders freely. It is estimated that there has been more remodeling of bank and other offices during the past two years than ever before in the history of the country, and the demand for bank and office railings, grating, etc., of brass and bronze, has been extremely good.

D. C. Thomas, superintendent of small supplies in the purchasing department of the Atchison, Topeka & Santa Fe, has been appointed sales representative of the Barco Brass & Joint Company, of Chicago, in western territory, with headquarters at Kansas City.

The Herron Bedstead Manufacturing Company, of Chattanooga, Tenn., manufacturers of iron and brass bedsteads, recently increased its capital stock from $10,000 to $100,000, and expects to increase its facilities. W. E. Herron, Shirley T. Herron and others signed the amended articles.

Vogt Brothers Manufacturing Company, recently incorporated in Louisville, is completing a new plant at Fourteenth and Main streets, in which it will manufacture brass and other metal goods, conducting its own molding and machining rooms.

The Bridgeford Manufacturing Company, of Louisville, to manufacture stoves, ranges, mantels, tin, copper and sheet iron parts, was recently incorporated with a capital of $184,000. The company will also conduct an enameling plant. P. C. Doerhofer, George Leff and J. W. Campbell are incorporators.

The large plumbing supply and brass handling house of the Ahrens & Ott Manufacturing Company, headed by Theodore Ahrens, head of the Standard Sanitary Manufacturing Company, of Pittsburgh, Pa., also operating the Ahrens & Ott plant at Louisville, which manufactures brass plumbing goods, has closed another big deal whereby the Ahrens & Ott Manufacturing Company has taken over the million dollar Rumley Company at St. Louis, Mo., one of the largest plumbing supply concerns in the mid west. The Louisville company will erect a new warehouse, and use the St. Louis house as one of its large western supply stations. Other branches are located at Chicago, several points in Texas and throughout the South.—O. V. N. S.

TRENTON, N. J.

MARCH 5, 1917.

When it was announced that the United States had broken off relations with Germany over the submarine warfare owners of metal plants where munitions are being made became alarmed over the visits of cranks to the works and had a number of extra officers do duty to keep suspicious persons away. The Jordan L. Mott Company, where time fuses are being manufactured, has various means to keep persons away from the plant who are not employed there. Besides a good sized police force of its own the company has a high fence surrounding the plant and on top of this is heavy barbed wire.

Standard Fuse Corporation, with a plant at Bordentown, has a novel scheme to prevent persons gaining access to the grounds. Three fences close together surround the plant. The middle fence, which is of metal, is charged with electricity, and intruders receive a shock if they attempt to climb over into the yard. The corporation has increased its guard and some night watchmen who were laid off some time ago have been put back on duty. In addition there are fourteen plain clothes men working in the shops. Two fires occurred at the plant during the past month. The first one was discovered in a pile of oil-soiled sacks, and the flames were subdued by employes while the fire was being fanned against the main plant by a heavy wind. Later a can of gasoline caught fire in some unknown manner. The Pennsylvania Railroad Company also engaged forty extra deputies to guard cars containing ammunition. These cars are temporarily stored along the different divisions in this city.

All the Trenton metal plants are very busy at the present time. The Mercer Automobile Company has let a contract for the erection of a big structure to be used as an assembling department. It will be 35 x 350 feet and three stories high.

The Billingham Foundry & Machine Company is very busy on general work. The Ingersoll-Trenton Watch Company has enough orders on hand to keep things humming for some time. The Trenton Brass & Machine Company is busy in its various departments. The Trenton Smelting & Refining Company is working to full capacity at both its Trenton plants. Other metal concerns reporting good business conditions are: McFarland Foundry & Machine Company, National Electric Plating Words, Bechtel Engraving Company, John A. Roebling's Sons Company, Clifford Novelty Works and the Riverside Metal Company.

It is rumored that the United States government has taken over the big munition plant owned by the Keystone Watch Case Company at Riverside, N. J., which had been closed for two weeks following the completion of a big order for the Russian government. It is further rumored that men from the Frankford, Pa., arsenal will be in charge of the plant when it reopens and that the government will use the works for the manufacture of shell parts for the army and navy. Officials of the watch case company refuse to discuss the matter.—C. A. L.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Waterbury Rolling Mills Company, Waterbury, Conn., has awarded a contract for three additions, 65 x 150 feet, one story; 32 x 150 feet and 19 x 66 feet.

The Bristol Brass Company, Bristol, Conn., is planning to build an addition, 100 x 120 feet to its casting shop, and another factory building, 100 x 100 feet, this spring.

The Bayonne Casting Company, Bayonne, N. J., manufacturer of Monel metal castings, has filed plans for an extension to cost $5,000 and not $10,000 as was published elsewhere.

The Pilling Brass Company, manufacturers of brass, copper, etc., Waterbury, Conn., is going to erect additions to its rolling mill, 100 x 200 feet; muffle room, 5 x 80 feet, and boiler room, 50 x 100 feet.

The Edna Brass Company, 529 Reading Square, Cincinnati, Ohio, has had plans prepared for a three-story machine shop. The company operates a brass, bronze and aluminum foundry, brass machine shop and tool and grinding rooms.

Ernest Vatier announces that he had bought out De Festetics Studios at Waterville, N. Y., and is now located at 545 W. 22nd street, New York City, making a specialty of fine art castings in bronze, silver and gold; also chasing and mould making.

The Electrolytic Zinc Company, Highlandtown, Md., is contemplating enlarging its electrolytic zinc plant, although nothing definite has been decided on as yet. The estimated cost of the addition to its plant is $75,000.

The Electro-Metal Finishing Works, Rittersville, Pa., has been organized to operate a job plating and finishing shop, and the departments included in the operation of the shop will be grind-

ing room, galvanizing, tinning, plating, polishing, japanning and lacquering.

The firm of the Enterprise Foundry Company, manufacturers of aluminum castings, etc., Detroit, Mich., has been re-incorporated with a capital stock of $30,000. The stockholders are Charles W. Carolin, George S. Cuddy and John Goshenhofer.

The McAdamite Company of Michigan, 57 Isabella Avenue, Detroit, Mich., has purchased the entire assets, good-will and business of the United States McAdamite Metal Company and will continue the general aluminum castings and foundry business of the former company under the same management.

The British America Nickel Corporation, Ltd., Toronto, Canada, while they are busily engaged in completing their smelting plant, report by E. P. Mathewson, general manager, that it will be at least a year and a half before they expect to be producing nickel.

The Schweers Hardware Company, Shawano, Wis., state that there is nothing to the published report that they are to establish a sheet-metal and tinware manufacturing department which will specialize in galvanized milk cans, tank heaters and other dairy and farm equipment.

The Du Pont Fabrikoid Company, with main offices at Wilmington, Del., has purchased the Marokene Company, of Elizabeth, N. J. The Marokene Company manufactures a material similar to fabrikoid, which is used extensively by the automobile, carriage and upholstery industries.

The Wheeler Condenser and Engineering Company, Carteret, N. J., manufacturer of pumps, engines and condeners, is building a machine shop. This company is now operating a new brass tube mill and is making commercial size of brass and copper tubes.

J. W. Riley, a well-known advertising novelty maker and formerly with the Gustave Fox Company, Cincinnati, Ohio, has organized the J. W. Riley Stamping Company, with headquarters at Newport, Ky., to manufacture advertising novelties. Anthony Rickman is vice-president and J. W. Riley is president of the new company.

The Ohio Brass Company, Mansfield, Ohio, has issued $500,000 in additional preferred stock, and it is stated that it is planning extensions to its plant in Mansfield and Barberton, Ohio. The company operates a brass foundry, brass machine shop, tool and grinding rooms which are used for the manufacture of their own products.

U. T. Hungerford Brass & Copper Company, New York, announce that they have opened a warehouse in Baltimore, Md., at Lombard and South streets, where they will carry ready for immediate shipment a complete stock of brass, copper and bronze materials. This stock, together with what is held in the New York warehouse, aggregates over 5,000,000 pounds.

The Taunton-New Bedford Copper Company, New Bedford, Mass., manufacturer of pure copper, yellow Muntz metal, naval brass and bronze and manganese bronze, etc., is having plans drawn for a new plant to replace the one recently destroyed by fire. The company operates smelting, refining, rolling mill, tinning and polishing departments.

The M. L. Oberdorfer Brass Company, foundry and manufacturer, Syracuse, N. Y., has awarded contract for a two-story addition to its plant, 50 x 100 feet ,for a complete core department which will allow for the expansion of its foundry. The increase will about double the present capacity and will give it an output of about 4,000,000 pounds of aluminum castings per year. Besides an aluminum foundry the company operates a brass and bronze foundry, brass machine shop and tool and grinding rooms.

The Egyptian Lacquer Manufacturing Company, manufacturers of lacquers for metal goods, New York, announces that the new plant which is in the course of construction at Kearny, N. J., is not being built to replace the plant which was partially destroyed at Rahway, N. J., as was stated elsewhere, but to take care of increasing demand for lacquers. The company states also that all repairs and replacements necessitated by the fire at the plant in Rahway have long since been completed and that the factory is running at its normal capacity.

The Detroit Brass Works and the Detroit Valve & Fittings Company, Detroit, Mich., have been consolidated and the name of the new corporation is the Detroit Valve & Fittings & Detroit Brass Works. The officers of the new company are as follows: E. B. Whitcomb, president; O. P. Benjamin, vice-president and general manager; F. L. Uhl, secretary and sales manager; W. E. Ganley, assistant secretary; A. L. Hanson, treasurer and D. M. Hamilton, assistant treasurer. The company manufactures brass goods for steam, water and gas and operates a brass and bronze foundry, brass machine shop, tool and grinding rooms, galvanizing, plating, polishing, japanning and lacquering departments.

REMOVAL

The New York office of the Titanium Alloy Manufacturing Company, Niagara Falls, N. Y., has been moved from 15 Wall street to the City Investment Building, 165 Broadway, New York.

CHANGE IN FIRM NAME

The firm name of Goldschmidt & Lyman, Inc., metal dealers in copper, spelter, lead, tin, antimony, etc., has been changed to Goldschmidt & Forbes, Inc., 90 West street, New York.

The Carson-Rowell Company, manufacturers of melting furnaces and melting ladles, also Round Bar babbitt metal, Appleton, Wis., has changed its name to the Rowell Manufacturing Company of which D. G. Rowell is president and John L. Hettinger, secretary.

GENERAL GRAPHITE COMPANY

The General Graphite Company, 1823-26 Jefferson Bank Building, Birmingham, Ala., has been incorporated under the laws of Delaware for $1,500,000 and will own and control exclusively some 10,000 acres of proven graphite bearing lands in the states of North and South Carolina, the chemical analysis of which, the company states, has shown them to be of superior quality to anything found in the United States. The company expects to commence actual mining operation between the first of May and the first of June, and in addition to carrying on the mining of graphite, intend to enter the manufacturing field and will place the finished products on the market.

CONNECTICUT COPPER CONSUMPTION

It is reported that the amounts of copper consumed by Connecticut metal concerns are as follows: The American Brass Company, with plants in Waterbury and Ansonia, approximately 1,000,000 pounds of copper a day, or 300,000,000 pounds annually; The Chase Rolling Mills Company of Waterbury, 144,000,000 pounds a year; Stamford Rolling Mills Company, of Stamford, 14,000,000 pounds a year; Randolph-Clowes Company, of Waterbury, 12,000,000 pounds a year; Plume & Atwood Manufacturing Compony, of Waterbury, 18,000,000 pounds a year; Bristol Brass Company, of Bristol, 15,000,000 pounds annually; Seymour Manufacturing Company, of Seymour, 42,000,000 pounds a year; Scovill Manufacturing Company, of Waterbury, 96,000,000 pounds annually; Bridgeport Brass Company, of Bridgeport, 72,000,000 pounds annually.

SCOVILL MFG. COMPANY'S EARNINGS

The annual report for the year 1916 of the Scovill Manufacturing Company, Waterbury, Conn., shows that it has been one of the most successful of the munition makers, its specialty being time fuses. Its net earnings, with but $5,000,000 capital stock, were $13,403,462 and it paid dividends of $111 a share for the year. Out of earnings the company spent $3,654,386 in plant additions and charged off about $2,000,000 for depreciation. The general reserve for contingencies and improvements was in-

creased from $1,500,000 to $4,000,000; a special reserve of $2,200,000 set up for taxes; and inventory increased about $1,800,000.

Some interesting figures obtained from the 1916 and 1914 balance sheets are these: Plant account increased from $4,357,656 to $9,811,933, cash from $343,560 to $6,047,763, and surplus from $3,063,845 to $15,911,670; accounts and bills receivable increased from $1,000,633 to $5,671,587, while, despite this heavy increase in business, accounts and bills payable at end of 1916 show only $809,567 against $2,882,354 in 1915 and $287,814 in 1914.

ANNUAL MEETING OF AMERICAN BRASS CO.

At the annual meeting of the American Brass Company, Waterbury, Conn., held February 6, the resignation of George E. Cole as assistant treasurer and auditor was reluctantly accepted. Mr. Cole went to the American Brass Company from the Coe Brass Company, Torrington, and had completed 25 years in the business.

The directors elected the following officers: Charles F. Brooker, president; John A. Coe, Jr., Edward L. Frisbie, John P. Elton and Thomas B. Kent, executive vice-presidents; John P. Elton, treasurer; Gordon W. Burnham, secretary; C. F. Hollister, assistant treasurer; Franklin E. Weaver, assistant secretary. The appointive vice-presidents in charge of the various branches of the company are as follows: F. L. Braman, Coe Brass, Torrington; H. M. Steele, Waterbury Brass Branch, Waterbury; William A. Cowles, Ansonia branches, Ansonia; Arthur S. Brown, Ansonia branches, Ansonia; George H. Allen, Kenosha branch, Kenosha, Wis.

1916 INDUSTRIAL INCOMES

The preliminary report of the National Enameling and Stamping Company, Brooklyn, N. Y., shows that 1916 was a record year. Net profits from operations amounted to $2,857,328, compared with $1,199,861 the year before. The balance available for common stock dividends was $2,132,921, equivalent to 13.6 per cent., against 3 per cent. in 1915. The surplus account was increased by $1,319,540, a sum equal to 8.46 per cent. on the common shares outstanding.

A gross income last year of $26,441,075 is reported in the annual statement of Winchester Repeating Arms Company, New Haven, Conn., one of the largest munitions plants doing business with foreign countries. This is a gain of $6,131,900 over 1915. The concern is to be reimbursed by the British government for an altered contract for Lee Enfield rifles. Special business taken by the New Haven firm from August, 1914, through December, 1916, exclusive of the Lee Enfield rifle contract, amounted to $37,149,169. The report concludes with the statement that manufacturing costs greatly increased because of the abnormal industrial conditions which have affected the whole country.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the name of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To deal in metal goods.—L. & L. Manufacturing Company, Newark, N. J. Capital, $10,000. Incorporators: John T. Litomy, Henry W. D. Loeffler and H. Edward Wolff.

To make metal specialties.—The State Sales Company, Cincinnati, Ohio. Capital, $5,000. Incorporators: Alice E. Mess, Anna Stuempel, C. J. Mess, O. F. Stuempel and W. F. Landwehr.

To manufacture brass articles.—The Superior Brass Manufacturing Company, Mansfield, Ohio. Capital, $35,000. Incorporators: W. J. Sprang, George M. Calhoun, Fred M. Bushness, B. B. Cappeller and T. R. Barnes.

To manufacture brass castings.—The Regent Brasss Foundry Company, Marysville, Ohio. Capital, $30,000. Incorporators: Joseph J. Klein, Alfred V. Birnbaum, A. J. Hale, S. M. Davis and E. Weinberger.

To manufacture metal castings.—The Brass and Bronze Castings Company, Cleveland, Ohio. Capital, $50,000. Incorporators: E. P. Strong, Fred Desberg, George Q. Keeley, A. J. Rother and F. A. Cook.

To make metal specialties.—The Bowman-Hosterman Company, Carrollton, Ohio. Capital, $25,000. Incorporators: George H. Bowman, E. S. Bowman, C. M. Bow, C. H. Colbourn and C. T. Brooks.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

MERGER OF PUBLISHERS OF ENGINEERING JOURNALS

The McGraw Publishing Company, Inc., and the Hill Publishing Company, both publishers of engineering journals, have consolidated as the McGraw-Hill Publishing Company, Inc. The new company acquires all the properties and interests of the two constituents, including Electrical World, Electrical Merchandising, Electric Railway Journal, Engineering Record, The Contractor, Metallurgical and Chemical Engineering, American Machinist, Power, Engineering News, Engineering and Mining Journal, and Coal Age.

Two of these papers, the Engineering News and the Engineering Record, will be consolidated as the Engineering News-Record, with Charles Whiting Baker, now editor of Engineering News, as editor. Officers of the new company are: President, James H. McGraw; vice-president and treasurer, Arthur J. Baldwin, who succeeded the late John Hill as president of the Hill Publishing Company; vice-president and general manager, E. J. Mehren, formerly editor of Engineering Record.

PRINTED MATTER

Metals—A very complete statistical report of the metals used in the metal industries was issued as a supplement to the Official Daily Metal Market Report on February 23. This report gives the daily average prices of copper, tin, lead and spelter. Copies of this report may be had by corresponding with the New York Metal Exchange, 111 Broadway, New York.

Oakite.—The Oakley Chemical Company, 22 Thames street, New York, manufacturers of Oakite and other chemicals used in the metal industries, has started the publication of a journal which they call "The Oakley Enterprise," or the news organ of the Oakley Company. Judging from the appearance of this little publication, of which the February issue is the first, and a study of its contents, causes one to become convinced that the Oakley Chemical Company believes in "practicing what they preach." The Oakley Enterprise is a clean little journal filled with facts on cleaning and is particularly devoted to explaining the merits of Oakite, the sterling cleaner, so claimed by the mbanufacturers. We believe that it would be well worth the while of anyone in the metal finishing business to ask to be put on the mailing list of this bright little paper.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE

NEW YORK, MARCH 5, 1917.

COPPER.

The copper industry throughout February was subjected to the strain of abnormal conditions due to domestic events and international complications entirely beyond ordinary business control which resulted in the crippling of production not only of raw material, but of refinery output as well. New business was interfered with, creating irregularities in prices with general uncertainty as to the future, which, while causing mental depression as to the outcome, did not in any way tend to weaken prices, but on the contrary, they were advanced 4 cents per pound by the ninth of the month, when prompt electrolytic sold at 35 cents per pound, lake at 33-34 cents and casting copper at 30-31 cents. The foreign market, in sympathy with conditions, here, was advanced on the thirteenth to £147 and 144 for spot and future electrolytic, respectively, and to £138 and 134 for prompt and future standard, respectively. High tension had developed in the trade by this time, and within the next few days there were sales of copper sheets at 44-45 cents and prompt-Feb. copper wire was sold at 42.50 with April-May positions at 40-41 cents per pound.

At the close of February the market was quiet and steady for electrolytic at 37 to 37¼ cents for prompt shipment, while March was offered 36½ cash New York.

TIN.

Fluctuations in tin during February covered a range of 10.15 cents per pound from the January closing price of 45.85 cents to the highest level reached, 56 cents on February 5, after which a reaction set in that carried prices downward 7.50 cents to 48 cents by February 20, followed by an immediate advance to 49.25-49.37½ cents by the 24th. Foreign markets rose and fell sympathetically, recording an advance of L9 at the highest level. Domestic transportation difficulties, at the beginning of the month, added to the alarm caused by the German submarine warfare that had produced intense excitement throughout the metal trade generally, but particularly in the tin industry, although ample supplies were known to be on hand. The asking price for spot was 58 cents with 56 cents bid. London advanced to £200 for spot Straits; £200-15s for spot standard and £201-15s future standard; with Singapore £202-15s cif. London equivalent. When the January monthly statistics were issued, visible supplies were shown to be 18,169 tons, a decrease of 2,568 tons during the month. Stocks in the United States were reduced 889 tons to 2,600 tons. By the 23rd, spot had advanced to 49.75 to 49.87½ cents per pound. Today spot is difficult to buy at 53 cents.

LEAD.

Lead prices in February advanced 2 cents per pound on spot, New York, and 1½ cents to 1¾ cents East St. Louis, with fractional corresponding advances on all positions, while lead ore at Joplin broke all previous price records on the 20th, when $110 to $120 was offered for ore without obtaining any. Shortage in production, due to lack of fuel, which was caused by railroad congestion and added to, by most unfavorable weather conditions, were the causes attributed for the trouble, especially in the Miami fields.

By the ninth, the official Trust price for lead was advanced $10 per ton to 8½ cents per pound, the highest price ever established by the American Smelting & Refining Company. Spot lead in the open market, at New York, sold at 9.25 cents and Feb.-March shipments from the West at 8.75 cents. Transactions were very small. From that time up to the closing days of the month, the scarcity of spot lead, shortage in production and deplorable freight traffic conditions caused prices to further advance until actual sales were made to consumers at 10.25 cents per pound for immediate delivery on the 16th—this being 1¾ cents premium over the Trust price—who, after covering immediate needs withdrew from the market. On the 20th, a sale was reported at 10.50 cents and inquiries were said to be in the market for 500 to 1,000 tons of spot that could not be supplied at any price. Later 10.75 cents per pound was asked but no sales were reported at this price.

SPELTER.

The February movement in spelter was continuously upward to the 24th of the month, showing a net advance on prompt and Feb. positions of ½ cent with fractional corresponding advances on March and second quarter. Immediately following International developments at the beginning of February, prices receded for several days, but the market retained a strong tone notwithstanding the unfavorable outlook caused by the uncertainty as to future developments. During the third week, greater strength was manifest with gradually rising prices, and quotations are prompt New York 10.80-11.05; East St. Louis, 10⅝-10⅞; March positions, New York 10.67-10.92 cents; East St. Louis 10½-10¾, and second quarter, New York 10.05-10.30c., and East St. Louis 9.87-10⅛ per pound.

ANTIMONY.

To the scarcity of spot antimony was attributed the sensational advance from 25 cents at the beginning of the month to 30-35 cents on the eighth, but with the arrival of 300 tons the following day, the situation was relieved and a reaction began which carried prices down to 29-30 cents on the 16th, after which freight congestion curtailing overland supplies, another advance occurred, which up to the 27th, had proceeded to 32.34 cents per pound, but the close is weak at 31 cents.

ALUMINUM.

The aluminum market was dull throughout the month, No. 1 Virgin remaining practically stationary in price at 57-59 cents, although a few sales for export of 25-ton lots for February,March shipment were reported in the latter part of the month; 98-99 per cent. remelted and No. 12 alloy remelted, declined 1 cent from 52-54 to 51-53 for the former and from 38-40 to 37-39 for the latter in the closing days.

SILVER.

The demand for coinage in countries where gold has been withdrawn from circulation carried prices upward to 79 cents, on the 13th of the month, the highest price level since 1893, after which there was a gradual recession to 77⅛ cents on the last day of the month.

QUICKSILVER.

Quicksilver registered an advance of $70 per flask, from $84 to $150 during the first half of the month, due to the threatened cutting-off of supplies by the German blockade, but gradually, as the month progressed, prices receded to $130 per flask, and today the price is $115.

PLATINUM.

Platinum steadily rose from $90 per ounce to $105 for pure, where it remained up to the close of the month.

OLD METALS.

Business in old metals received only a temporary set-back by the breaking of our diplomatic relations with Germany—some irregularities in prices being noted for a time, but by the 13th, renewed activity developed, continuing to the close of the month when a careful comparison of prices showed a general gain of from .25 cent to 3.00 cents on the various kinds of metal listed.

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

Lake Copper, 1916—Average for year, 28.77. 1917—January, 32.25. February, 35.25.

Brass Mill Spelter, 1916—Average for year, 17.725. 1917—January, 13.05. February, 13.80.

FEBRUARY MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	36.00	30.00	34.04
Electrolytic	37.00	31.00	35.22
Casting	34.00	28.00	31.73
TIN	55.00	48.75	51.36
LEAD	8.50	8.00	8.34
SPELTER	10.92	9.55	10.49
ANTIMONY	35.00	25.00	30.00
SILVER (cts. per oz.)	79.00	76.75	77.57

Metal Prices, March 5, 1917

NEW METALS.	Price per lb.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	38.00
Electrolytic, carload lots	36.50
Casting, carload lots	33.50
TIN—Duty Free.	
Straits of Malacca, carload lots	53.00
LEAD—Duty Pig, Bars and Old 25%; pipe and sheets.	
20%. Pig lead, carload lots	10.25
SPELTER—Duty 15%.	
Brass Special	11.00
Prime Western, carload lots, nominal	11.00
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½ per lb.	
small lots, f. o. b factory	67.00
100-lb. f. o. b. factory	63.00
Ton lots, f. o. b. factory	59.00
ANTIMONY—Duty 10%.	
Cookson's Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	31.00
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot Placquettes, Ingots, Blocks	50.00 to 55.00
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	$3.50
BISMUTH—Duty free	$3.00
CADMIUM—Duty free	nominal $1.75
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	$1.70
QUICKSILVER—Duty, 10% per flask of 75 pounds	$115.00
PLATINUM—Duty free, per ounce	$105.00
SILVER—Government assay—Duty free, per ounce	76.94c.
GOLD—Duty free, per ounce	$20.67

INGOT METALS.		Price per lb.
Silicon Copper, 10%	according to quantity	46 to 49
Silicon Copper, 20%	" "	47 to 50
Silicon Copper, 30% guaranteed	" "	49 to 52
Phosphor Copper, guaranteed 15%	" "	50 to 55
Phosphor Copper, guaranteed 10%	" "	49 to 54
Manganese Copper, 30%, 2% Iron	" "	50 to 55
Phosphor Tin, guaranteed 5%.	" "	66 to 70
Phosphor, Tin, no guarantee	" "	53 to 55
Brass Ingot, Yellow	" "	24 to 26
Brass Ingot, Red	" "	30 to 32
Bronze Ingot	" "	30 to 32
Parsons Manganese Bronze Ingots	" "	33½ to 35
Manganese Bronze Castings	" "	45 to 52½
Manganese Bronze Ingots	" "	30 to 35
Phosphor Bronze	" "	34 to 36
Casting Aluminum Alloys	" "	42⅞ to 45

Dealers' Buying Prices.	OLD METALS.	Dealers' Selling Prices.
30.00 to 31.00	Heavy Cut Copper	32.50 to 33.00
28.00 to 28.50	Copper Wire	30.00 to 30.50
24.00 to 25.00	Light Copper	26.00 to 27.00
23.00 to 24.00	Heavy Mach. Comp	25. to 26.50
15.25 to 16.00	Heavy Brass	17.00 to 18.00
12.00 to 13.00	Light Brass	13.50 to 14.30
15.75 to 16.25	No. 1 Yellow Brass Turning	16.50 to 17.25
16.25 to 17.00	No. 1 Comp. Turnings	17.00 to 18.00
8.00 to 8.25	Heavy Lead	8.62 to 8.75
7.50 to 8.00	Zinc Scrap	8.50 to 9.00
18.00 to 20.00	Scrap Aluminum Turnings	20.00 to 22.00
24.00 to 25.00	Scrap Aluminum, cast alloyed	30.00 to 32.00
45.00 to 48.00	Scrap Aluminum, sheet (new)	48.00 to 50.00
32.00 to 33.00	No. 1 Pewter	34.00 to 35.00
28.00 to 30.00	Old Nickel	32.00 to 34.00
21.00 to 23.00	Old Nickel anodes	25.00 to 26.00

PRICES OF SHEET COPPER.

Mill shipments (hot rolled) ..... 44c. base net
From stock ..... 46c. base net

Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
	SIZE OF SHEETS.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 96 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches	2	4	7						
	Not longer than 120 inches	3	5	9						
Wider than 96 ins., but not wider than 120 ins.	Not longer than 120 inches	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER. SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

Metal Prices, March 5, 1917

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect November 18, 1916.[1]

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.43	$0.44½	$0.47
Wire	.43	.44½	.47
Rod	.43	.45½	.48
Brazed tubing	.48	—	.52
Open seam tubing	.48	—	.52
Angles and channels	.48	—	.52

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.45	$0.46½	$0.49
Wire	.45	.46½	.49
Rod	.45	.47½	.50
Brazed tubing	.50	—	.54
Open seam tubing	.50	—	.54
Angles and channels	.50	—	.54

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

38c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order..... 45c. per lb. base
100 lbs. to 300 lbs. in one order..... 45½c. " " "
Less than 100 lbs. in one order..... 47c. " " "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1⅛ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, — per lb.
Seamless Copper Tubing, — per lb.

For other sizes see Manufacturers' List.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛ ¼ ⅜ ½ ¾ 1 1¼ 1½ 2 2½ 3 3½ 4 4½ 5

Due to fluctuations of the metal market we are unable to quote these prices.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod..... 42c. net base
Muntz or Yellow Metal Sheathing (14" x 48")..... 38c. " "
Muntz or Yellow Metal Rectangular sheets other than sheathing. 43c. " "
Muntz or Yellow Metal Rod..... 39½c. " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 65c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES OF NICKEL ANODES.

85 to 87% purity ..... 47½c. per lb.
90 to 92% " ..... 50c. " "
95 to 97% " ..... 52½c. " "

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Base price, 60c.

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

PRICE LIST SEAMLESS ALUMINUM TUBING.

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

We are unable to quote these prices.

PRICES OF SHEET ZINC.

Duty, sheet, 15%. Cents per lb.
Carload lots, standard sizes and gauges, at mill.....21 cent basis, less 8%
Casks, jobbers' prices 22.00
Open casks, jobbers' prices 22½

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	48½c.	16%	53c.
8%	49½c.	18%	53½c.
10%	49¾c.	20%	55¼c.
12%	51½c.	25%	65c.
15%	52c.	30%	68½c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%	50c.	15%	58c.
8%	52c.	16%	58½c.
10%	54c.	18%	60½c.
12%	56c.	30%	76c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 7c. over Pig Tin. 50 to 100 lbs. 8c. over, 25 to 50 lbs. 9c. over, less than 25 lbs. 15c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.

PRICES OF SOME METAL INDUSTRY CHEMICALS AND MATERIALS.

Phosphorus—Duty free, according to quantity	40c. to 50c.	per lb.
Nickel Salts, Single bbl.	14c.	" "
Nickel Salts, Double bbl.	11c.	" "
Sodium Cyanide	Nominal	
Silver Nitrate	53⅜c.	per oz.
Sodium Carbonate (Sal Soda)	.05c.	per lb.

Prices for Cotton Buffs.

Open buffs per 100 sections.

12 inch, 20 ply, 64/68, cloth				base	$30.90
14 " 20 " 64/68 "				"	40.00
12 " 20 " 84/92 "				"	37.30
14 " 20 " 84/92 "				"	48.35

Sewed buffs per pound.

Bleached and unbleached	base	30c.
Colored	"	27c.